(19)日本国特許庁（ＪＰ）　(12) **公開特許公報（Ａ）**　(11)特許出願公開番号

特開平11－316839

(43)公開日　平成11年(1999)11月16日

(51)Int.Cl.[6]		識別記号	FI		
Ｇ０６Ｔ	7/00		Ｇ０６Ｆ	15/70	３１０
Ｈ０４Ｎ	1/60			15/62	４１０Ｚ
	1/46			15/70	４５５Ａ
			Ｈ０４Ｎ	1/40	Ｄ
				1/46	Ｚ

審査請求　未請求　請求項の数14　ＯＬ　（全 19 頁）

(21)出願番号　特願平10－123797

(22)出願日　平成10年(1998)５月６日

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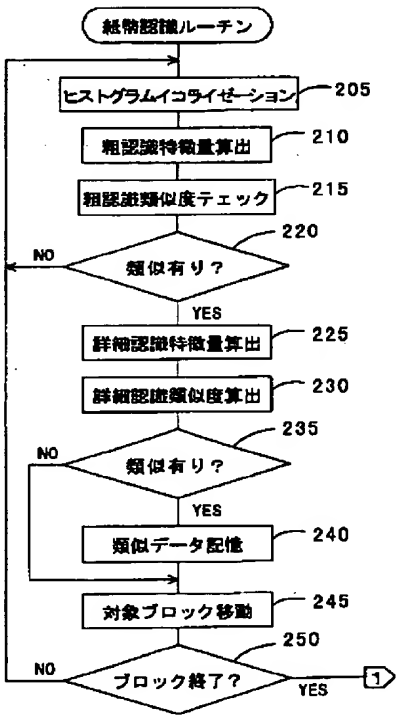
(54)【発明の名称】　画像粗認識装置、画像粗認識方法、画像粗認識プログラムを記録した媒体、画像認識装置およびカラー複写装置

(57)【要約】

【課題】　紙幣の画像データのパターンマッチングを図るのは莫大なデータ量となるし、斜めに配置されているものまでパターンマッチングしようとすれば更に演算量が増えていた。

【解決手段】　図柄に着目した画像認識を行う前に、主に色度に関する分布状況を表す特徴量を粗認識のために算出する（ステップ２１０）とともに、この特徴量に基づいてデータベースと比較して粗認識としての類似度を算出し（ステップ２１５）、類似すると判断された場合にだけ（ステップ２２０）、図柄に関する詳細認識を行うようにしたため、低確率で混入しうる紙幣などを排除するために、常に詳細認識を行う必要が無くなり、処理時間などを高速化することができる。



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【特許請求の範囲】

【請求項１】　被検物の画像データに基づいて所定の小領域における主に色度に関する分布状況をデータベース化した記憶手段と、

カラー画像データを取得する画像データ入力手段と、

この読み込まれたカラー画像データから上記小領域に対応する領域ごとに上記分布状況を取得する検索情報取得手段と、

この取得された分布状況に基づいて上記記憶手段のデータベースを検索して上記被検物から得られた分布状況に該当するものがあるか否かを判断する判定手段とを具備することを特徴とする画像粗認識装置。

【請求項２】　上記請求項１に記載の画像粗認識装置において、上記分布状況は、矩形領域を縦方向と横方向に複数列に区分し、各列について代表値を求め、この代表値について特徴量を算出した値であることを特徴とする画像粗認識装置。

【請求項３】　上記請求項２に記載の画像粗認識装置において、上記分布状況は、この各列についての代表値に基づく分散値あるいはその代替値であることを特徴とする画像粗認識装置。

【請求項４】　上記請求項１～請求項３のいずれかに記載の画像粗認識装置において、上記分布状況は、正規化した輝度あるいは輝度の代替値を使用することを特徴とする画像粗認識装置。

【請求項５】　上記請求項１～請求項４のいずれかに記載の画像粗認識装置において、上記分布状況は、色差についての分布状況であることを特徴とする画像粗認識装置。

【請求項６】　上記請求項１～請求項５のいずれかに記載の画像粗認識装置において、上記分布状況は、輝度についての分布状況であることを特徴とする画像粗認識装置。

【請求項７】　上記請求項１～請求項６のいずれかに記載の画像粗認識装置において、上記特徴量は、複数の分布状況から得られるものであることを特徴とする画像粗認識装置。

【請求項８】　上記請求項１～請求項７のいずれかに記載の画像粗認識装置において、上記記憶手段は、上記被検物を間隔をおいた複数の角度で回転させたときにおけるそれぞれの上記分布状況を記憶することを特徴とする画像粗認識装置。

【請求項９】　上記請求項８に記載の画像粗認識装置において、上記記憶手段は、一象限における複数の回転角度での分布状況を記憶しつつ、上記検索情報取得手段は、各象限毎に対象性を反映した四象限分の分布状況を抽出することを特徴とする画像粗認識装置。

【請求項１０】　上記請求項１～請求項９のいずれかに記載の画像粗認識装置において、上記記憶手段は、上記分布状況についての上限値と下限値とを備え、上記判定

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手段は、上記取得された分布状況がこの上限値と下限値との間に入るか否かを判断することを特徴とする画像粗認識装置。

【請求項１１】　カラー画像に被検物の画像が含まれているか否かを判定する画像粗認識方法であって、

上記被検物の画像データに基づいて所定の小領域における主に色度に関する分布状況のデータベースを作成しておくとともに、

カラー画像データを取得する画像データ入力工程と、

この読み込まれたカラー画像データから上記小領域に対応する領域ごとに上記分布状況を取得する検索情報取得工程と、

この取得された分布状況に基づいて上記データベースを検索して上記被検物から得られた分布状況に該当するものがあるか否かを判断する判定工程とを具備することを特徴とする画像粗認識方法。

【請求項１２】　カラー画像に被検物の画像が含まれているか否かを判定する画像粗認識プログラムを記録した媒体であって、

上記被検物の画像データに基づいて所定の小領域における主に色度に関する分布状況のデータベースを作成しておくとともに、

カラー画像データを取得する画像データ入力ステップと、

この読み込まれたカラー画像データから上記小領域に対応する領域ごとに上記分布状況を取得する検索情報取得ステップと、

この取得された分布状況に基づいて上記データベースを検索して上記被検物から得られた分布状況に該当するものがあるか否かを判断する判定ステップとを具備することを特徴とする画像粗認識プログラムを記録した媒体。

【請求項１３】　被検物の画像データに基づいて所定の小領域における主に色度に関する分布状況をデータベース化した第一の記憶手段と、

同小領域における図柄をデータベース化した第二の記憶手段と、

カラー画像データを取得する画像データ入力手段と、

この読み込まれたカラー画像データから上記小領域に対応する領域ごとに上記分布状況を取得する第一の検索情報取得手段と、

同領域ごとに図柄を取得する第二の検索情報取得手段と、

この取得された分布状況に基づいて上記第一の記憶手段のデータベースを検索して上記被検物から得られた分布状況に該当するものがあるか否かを判断する第一の判定手段と、

この第一の判定手段にて該当するものがあると判断された場合に上記第二の検索情報取得手段にて取得された図柄に基づいて上記第二の記憶手段のデータベースを検索して上記被検物から得られた図柄に該当するものがある

か否かを判断する第二の判定手段とを具備することを特徴とする画像認識装置。

【請求項１４】　被検物の画像データに基づいて所定の小領域における主に色度に関する分布状況をデータベース化した第一の記憶手段と、

同小領域における図柄をデータベース化した第二の記憶手段と、

被複写物についてのカラー画像データを取得する画像データ入力手段と、

この読み込まれたカラー画像データから上記小領域に対応する領域ごとに上記分布状況を取得する第一の検索情報取得手段と、

同領域ごとに図柄を取得する第二の検索情報取得手段と、

この取得された分布状況に基づいて上記第一の記憶手段のデータベースを検索して上記被検物から得られた分布状況に該当するものがあるか否かを判断する第一の判定手段と、

この第一の判定手段にて該当するものがあると判断された場合に上記第二の検索情報取得手段にて取得された図柄に基づいて上記第二の記憶手段のデータベースを検索して上記被検物から得られた図柄に該当するものがあるか否かを判断する第二の判定手段と、

上記カラー画像データに基づいてカラー印刷を行うカラー印刷手段と、

上記第二の判定手段にて該当するものがあると判断された場合に上記カラー印刷手段によるカラー印刷を禁止する印刷禁止手段とを具備することを特徴とするカラー複写装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、画像粗認識装置、画像粗認識方法、画像粗認識プログラムを記録した媒体、画像認識装置およびカラー複写装置に関する。

【０００２】

【従来の技術】カラー複写装置の精度が向上するのにつれて、紙幣などの複写すべきでない画像をどのようにして禁止すべきかということが課題になりつつある。アナログ技術を利用するものはともかく、ディジタル処理を介在するカラー複写装置では、読み込んだカラー画像に紙幣の画像が含まれているか否かを判定することが提案されている。この場合、紙幣の画像データを記憶しておき、読み込んだカラー画像データと紙幣の画像データとをパターンマッチングさせる。

【０００３】

【発明が解決しようとする課題】従来より提案されているように、読み込んだカラー画像データと紙幣の画像データとをパターンマッチングさせることは技術的に不可能ではないものの、実践することは難しい。例えば、複写に耐える程度の画像密度は非常に高く、このレベルで

紙幣の画像データのパターンマッチングを図るのは莫大なデータ量となるからである。また、汚れやしわも問題になることが多いし、斜めに配置されているものまでパターンマッチングしようとすれば更に演算量が増える。

【０００４】従って、従来から提案されている程度の技術は実際には実現不可能なものにすぎなかった。一方、本出願人は、このような状況に鑑みて、紙幣における三つの小領域を低解像度でデータベース化しておくとともに、読み込んだカラー画像データについても低解像度化し、小領域毎に画像が該当するか否かを判定する技術を開発した。本技術については後述する実施形態の中で詳述するが、この場合でも小領域ごとについて図柄が一致するか否かを判定するものであるため、演算量の低減化はさらなる目的として残されていた。

【０００５】本発明は、上記課題にかんがみてなされたもので、紙幣などを複写しないようにさせるにあたってより短時間に判定できるようにすることが可能な画像粗認識装置、画像粗認識方法、画像粗認識プログラムを記録した媒体、画像認識装置およびカラー複写装置の提供を目的とする。

【０００６】

【課題を解決するための手段】上記目的を達成するため、請求項１にかかる発明は、被検物の画像データに基づいて所定の小領域における主に色度に関する分布状況をデータベース化した記憶手段と、カラー画像データを取得する画像データ入力手段と、この読み込まれたカラー画像データから上記小領域に対応する領域ごとに上記分布状況を取得する検索情報取得手段と、この取得された分布状況に基づいて上記記憶手段のデータベースを検索して上記被検物から得られた分布状況に該当するものがあるか否かを判断する判定手段とを具備する構成としてある。

【０００７】上記のように構成した請求項１にかかる発明においては、記憶手段にて被検物の画像データに基づいて所定の小領域における主に色度に関する分布状況をデータベース化しておき、画像データ入力手段にてカラー画像データを取得すると、検索情報取得手段はこの読み込まれたカラー画像データから上記小領域に対応する領域ごとに上記分布状況を取得する。すると、判定手段はこの取得された分布状況に基づいて上記記憶手段のデータベースを検索し、上記被検物から得られた分布状況に該当するものがあるか否かを判断する。この結果、該当するものがあれば読み込んだカラー画像データの中に被検物の画像が含まれている可能性が高いといえる。記憶手段がデータベース化しているのは、小領域における主に色度に関する分布状況であり、広くは小領域全体の色調を表すものと言える。すなわち、被検物ごとに概ねの色調があることが多いから、その色調に特徴を見出すことができる場合に色調の一致が極めて有効といえる。むろん、色調は図柄を代表するという意味で広義には明

るさの分布状況などを排除する意味ではない。

【０００８】色度の分布状況は各種の演算によって求めることができるが、図柄の分布を考えると一律に平均化するのは認識効率に限りがある。このため、図柄の分布を表す一例として、請求項２にかかる発明は、請求項１に記載の画像粗認識装置において、上記分布状況は、矩形領域を縦方向と横方向に複数列に区分し、各列について代表値を求め、この代表値について特徴量を算出した値で構成してある。上記のように構成した請求項２にかかる発明においては、上記分布状況は、まず、矩形領域を縦方向と横方向に複数列に区分し、各列について代表値を求める。この状態ではまだ複数列分の代表値が存在するので、次に、この代表値に基づいて特徴量を算出する。ここでいう特徴量は必ずしも一つでなければならないというわけではない。ただし、少ない方が判断の作業量が減る反面で、誤認識の可能性も増えるため、必要性に応じて増減させるようにすればよい。

【０００９】少ない特徴量で分布状況を表す一例として、請求項３にかかる発明は、請求項２に記載の画像粗認識装置において、上記分布状況は、この各列についての代表値に基づく分散値あるいはその代替値で構成してある。上記のように構成した請求項３にかかる発明においては、各列を代表する代表値についてのバラツキ具合を表す分散値を利用するため、分布状況を表す上では都合がよい。むろん、同様の意味で分散値は標準偏差などの代替値であってもよい。

【００１０】主に色度の分布状況を求めるとしても、紙幣を例にすれば汚れやしわなどによって画像データなどは容易に変化しうる。新札だけを前提としていては全く使いものにならない。このような画像データの変化に対する対策の一例として、請求項４にかかる発明は、請求項１～請求項３のいずれかに記載の画像粗認識装置において、上記分布状況は、正規化した輝度あるいは輝度の代替値を使用する構成としてある。

【００１１】上記のように構成した請求項４にかかる発明においては、画像データにおける輝度あるいは輝度の代替値を正規化した上で分布状況に使用する。例えば、画像データが要素色の濃度の階調値で表されるような場合、全体的に汚れが目立って輝度が低いものとなったとしても、これを正規化することによって汚れの有無の影響を排除しやすくなる。ここでいう輝度は画像データを構成する一つの画素としての輝度と考えることもできるし、一つの画素を構成する要素色毎の階調値を輝度と考えることもできる。

【００１２】分布状況自体は主に色度に関するものであればよく、具体的には各種のものを採用可能である。その一例として、請求項５にかかる発明は、請求項１～請求項４のいずれかに記載の画像粗認識装置において、上記分布状況は、色差についての分布状況で構成してある。上記のように構成した請求項５にかかる発明においては、色差についての分布状況を利用しており、この色差は輝度だけの成分ではない反面、色調を見る上では利用しやすい特性をもつからである。

【００１３】また、他の一例として、請求項６にかかる発明は、請求項１～請求項５のいずれかに記載の画像粗認識装置において、上記分布状況は、輝度についての分布状況で構成してある。上記のように構成した請求項６にかかる発明においては、輝度についての分布状況を利用している。色度の分布状況として明るい色の分布や暗い色の分布も識別性という意味では有用な特性を持つからである。特徴量は必ずしも一種類のものである必要はない。この意味で、請求項７にかかる発明は、請求項１～請求項６のいずれかに記載の画像粗認識装置において、上記特徴量は、複数の分布状況から得られるもので構成してある。

【００１４】上記のように構成した請求項７にかかる発明においては、色差の分布状況であるとか、輝度の分布状況であるとか他の分布状況であるというように、複数の分布状況から特徴量を得るようにしている。被検物を全体としてでなく、小領域に着目して認識しつつ、さらに分布状況というように抽象化するのは、粗認識だけにとどまらない便利さも生じる。その一例として、請求項８にかかる発明は、請求項１～請求項７のいずれかに記載の画像粗認識装置において、上記記憶手段は、上記被検物を間隔をおいた複数の角度で回転させたときにおけるそれぞれの上記分布状況を記憶する構成としてある。

【００１５】上記のように構成した請求項８にかかる発明においては、上記被検物を間隔をおいた複数の角度で回転させ、それぞれの上記分布状況を記憶しており、紙幣などが斜めに配置された画像データに入っていたとしても、斜めの状態の小領域の分布状況で記憶手段を検索することにより該当するものを見つけられる。これは小領域であるが故に回転させたとしても記憶領域が膨大になることを避けられるし、分布状況というように抽象化することによって回転角度がある程度ずれていたとしても一致するものを見つけられやすいということに基づく。

【００１６】回転方向は厳密には３６０度存在することになるが、必ずしも全方位において分布状況を準備しなければならないわけではない。その一例として、請求項９にかかる発明は、請求項８に記載の画像粗認識装置において、上記記憶手段は、一象限における複数の回転角度での分布状況を記憶しつつ、上記検索情報取得手段は、各象限毎に対象性を反映した四象限分の分布状況を抽出する構成としてある。

【００１７】上記のように構成した請求項９にかかる発明においては、全方位を四象限に分離し、その一象限についてだけの回転角度で分布状況を記憶し、データの量は単純に１／４となる。また、このようにしたとしても検索情報取得手段が各象限毎に対象性を反映した四象限

分の分布状況を抽出するので、全方位について回転した場合と全く同様にして判定することになる。画像データから取得された分布状況と被検物から得られた分布状況とが該当するか否かを判断するにあたり、各種の比較方法を採用可能である。その一例として、請求項１０にかかる発明は、請求項１～請求項９のいずれかに記載の画像粗認識装置において、上記記憶手段は、上記分布状況についての上限値と下限値とを備え、上記判定手段は、上記取得された分布状況がこの上限値と下限値との間に入るか否かを判断する構成してある。

【００１８】上記のように構成した請求項１０にかかる発明においては、上記取得された分布状況が上記記憶手段にて記憶されている分布状況の上限値と下限値との間に入るか否かを上記判定手段が判断する。すなわち、単に大小関係だけを判定することにより、演算処理は格段に少なくなる。特に、複数の分布状況を利用する場合にはそれぞれの評価を調整しなければならない状況が生じうるが、上限値と下限値を利用する場合にはそれぞれがその範囲に入るか否かだけを判断すれば良くなる。

【００１９】このように、小領域における主に色度に関する分布状況に基づいて画像データ中に被検物の画像があるか否かを判断する手法は必ずしも実体のある装置に限られる必要はなく、その方法としても機能することは容易に理解できる。このため、請求項１１にかかる発明は、カラー画像に被検物の画像が含まれているか否かを判定する画像粗認識方法であって、上記被検物の画像データに基づいて所定の小領域における主に色度に関する分布状況のデータベースを作成しておくとともに、カラー画像データを取得する画像データ入力工程と、この読み込まれたカラー画像データから上記小領域に対応する領域ごとに上記分布状況を取得する検索情報取得工程と、この取得された分布状況に基づいて上記データベースを検索して上記被検物から得られた分布状況に該当するものがあるか否かを判断する判定工程とを具備する構成としてある。

【００２０】すなわち、必ずしも実体のある装置に限らず、その方法としても有効であることに相違はない。ところで、このような画像粗認識装置は単独で存在する場合もあるし、ある機器に組み込まれた状態で利用されることもあるなど、発明の思想としてはこれに限らず、各種の態様を含むものである。従って、ソフトウェアであったりハードウェアであったりするなど、適宜、変更可能である。発明の思想の具現化例として画像粗認識装置のソフトウェアとなる場合には、かかるソフトウェアを記録した記録媒体上においても当然に存在し、利用されるといわざるをえない。

【００２１】その一例として、請求項１２にかかる発明は、カラー画像に被検物の画像が含まれているか否かを判定する画像粗認識プログラムを記録した媒体であって、上記被検物の画像データに基づいて所定の小領域における主に色度に関する分布状況のデータベースを作成しておくとともに、カラー画像データを取得する画像データ入力ステップと、この読み込まれたカラー画像データから上記小領域に対応する領域ごとに上記分布状況を取得する検索情報取得ステップと、この取得された分布状況に基づいて上記データベースを検索して上記被検物から得られた分布状況に該当するものがあるか否かを判断する判定ステップとを具備する構成としてある。

【００２２】むろん、その記録媒体は、磁気記録媒体であってもよいし光磁気記録媒体であってもよいし、今後開発されるいかなる記録媒体においても全く同様に考えることができる。また、一次複製品、二次複製品などの複製段階については全く問う余地無く同等である。その他、供給方法として通信回線を利用して行なう場合でも本発明が利用可能なことにはかわりない。さらに、一部がソフトウェアであって、一部がハードウェアで実現されている場合においても発明の思想において全く異なるものではなく、一部を記録媒体上に記憶しておいて必要に応じて適宜読み込まれるような形態のものとしてあってもよい。

【００２３】このような画像粗認識装置は、それ自体として紙幣などの画像の有無を確実に判断するものではなく、被検物の画像が含まれていれば詳細な検査へ引き継ぐことを前提として利用価値が生じる。この場合、本画像粗認識装置とは別個に画像認識装置やカラー複写装置を備えることも可能であるものの、これらと一体的になって効率向上を図ることも可能である。請求項１３にかかる発明は、被検物の画像データに基づいて所定の小領域における主に色度に関する分布状況をデータベース化した第一の記憶手段と、同小領域における図柄をデータベース化した第二の記憶手段と、カラー画像データを取得する画像データ入力手段と、この読み込まれたカラー画像データから上記小領域に対応する領域ごとに上記分布状況を取得する第一の検索情報取得手段と、同領域ごとに図柄を取得する第二の検索情報取得手段と、この取得された分布状況に基づいて上記第一の記憶手段のデータベースを検索して上記被検物から得られた分布状況に該当するものがあるか否かを判断する第一の判定手段と、この第一の判定手段にて該当するものがあると判断された場合に上記第二の検索情報取得手段にて取得された図柄に基づいて上記第二の記憶手段のデータベースを検索して上記被検物から得られた図柄に該当するものがあるか否かを判断する第二の判定手段とを具備する構成としてある。

【００２４】上記のように構成した請求項１３にかかる発明においては、第一の記憶手段にて被検物の画像データに基づいて所定の小領域における主に色度に関する分布状況をデータベース化しておくとともに、第二の記憶手段にて同小領域における図柄をデータベース化しておく。ここで、画像データ入力手段がカラー画像データを

取得すると、第一の検索情報取得手段がこの読み込まれたカラー画像データから上記小領域に対応する領域ごとに上記分布状況を取得し、第一の判定手段にてこの取得された分布状況に基づいて上記第一の記憶手段のデータベースを検索して上記被検物から得られた分布状況に該当するものがあるか否かを判断する。一方、第二の検索情報取得手段ではこの領域に対応して図柄を取得しており、第一の判定手段にて該当するものがあると判断された場合には第二の判定手段が上記第二の検索情報取得手段にて取得された図柄に基づいて上記第二の記憶手段のデータベースを検索し、上記被検物から得られた図柄に該当するものがあるか否かを判断する。

【００２５】すなわち、小領域毎に色度に関する分布状況に基づいて被検物の画像の有無を判定するとともに、同じような小領域について図柄の一致を判定できるようにもしてあり、粗認識といえる分布状況の一致が見られた場合に図柄の一致を判定することにより、演算に時間がかかる図柄の一致の判定作業を低減させることになる。この場合において図柄の判定は小領域で行われ、これ自体においても判定作業量は低減する。

【００２６】図柄の判定を小領域ごとに行うことは、必ずしも全体としての一致を判断しないことを意味するものではない。すなわち、小領域での一致が見られればその情報に基づいて被検物全体の画像が含まれるかを判定してもよい。この場合、小領域の画像と全体の画像との相対的位置関係から全体の画像の位置が分かっているはずであり、比較の作業量は限定される。また、一つの被検物について複数の小領域について図柄の一致を判断し、一致した場合にはその位置情報を記憶するようにしてもよい。そして、最後に位置情報相互を解析し、本来の小領域同士の相対位置関係と一致する場合に被検物の画像が含まれるものと判断することができる。

【００２７】さらに、このように画像認識するのは被検物の画像が複写されないようにするという目的であることが多いことを鑑みれば、カラー複写装置として実現することも可能である。そのような一例として、請求項１４にかかる発明は、被検物の画像データに基づいて所定の小領域における主に色度に関する分布状況をデータベース化した第一の記憶手段と、同小領域における図柄をデータベース化した第二の記憶手段と、被複写物についてのカラー画像データを取得する画像データ入力手段と、この読み込まれたカラー画像データから上記小領域に対応する領域ごとに上記分布状況を取得する第一の検索情報取得手段と、同領域ごとに図柄を取得する第二の検索情報取得手段と、この取得された分布状況に基づいて上記第一の記憶手段のデータベースを検索して上記被検物から得られた分布状況に該当するものがあるか否かを判断する第一の判定手段と、この第一の判定手段にて該当するものがあると判断された場合に上記第二の検索情報取得手段にて取得された図柄に基づいて上記第二の記憶手段のデータベースを検索して上記被検物から得られた図柄に該当するものがあるか否かを判断する第二の判定手段と、上記カラー画像データに基づいてカラー印刷を行うカラー印刷手段と、上記第二の判定手段にて該当するものがあると判断された場合に上記カラー印刷手段によるカラー印刷を禁止する印刷禁止手段とを具備する構成としてある。

【００２８】上記のように構成した請求項１４にかかる発明においては、同様にして粗認識を経た上で図柄の一致が見られる場合、上記第二の判定手段にて該当するものがあると判断されることになるから、印刷禁止手段はカラー印刷手段によるカラー印刷を禁止する。むろん、図柄の一致が見られない通常の場合にはカラー印刷手段が上記カラー画像データに基づいてカラー印刷を行う。

【００２９】

【発明の効果】以上説明したように本発明は、小領域における主に色度に関する分布状況から粗認識として被検物の画像が含まれているか否かを判断することにより、このような被検物が含まれていないほとんどの場合に多大な作業量を要する図柄の比較を行わなくて済むようになり、全体としての効率を向上させることが可能な画像粗認識装置を提供することができる。

【００３０】また、請求項２にかかる発明によれば、縦横方向に区分した列を基準として分布状況を求めるようにしたため、分布状況を表しやすく、作業量も少なくできる。さらに、請求項３にかかる発明によれば、分散値を利用するので分布状況を表しやすい。さらに、請求項４にかかる発明によれば、輝度を正規化することにより、汚れなどの影響を受けにくくなる。さらに、請求項５にかかる発明によれば、判定に利用する色差が比較的容易に算出でき、作業量が少なくなる。

【００３１】さらに、請求項６にかかる発明によれば、一般的な輝度自体も利用するので、新たに演算をしなくても良くなることが多く、作業量が少なくなる。さらに、請求項７にかかる発明によれば、複数の分布状況から総合的に判定して認識効率を向上させることができる。さらに、請求項８にかかる発明によれば、小領域における分布状況を利用するためデータ量が少なく、予め複数の回転角度を設定してデータベース化するのが現実的であり、かつ、その検索も容易となる。

【００３２】さらに、請求項９にかかる発明によれば、データベースの容量を少なくしつつ、全方位の回転に対応可能となる。さらに、請求項１０にかかる発明によれば、上限値と下限値とで範囲を設定してその間に入るか否かを判定するので、判断に要する作業量が少なくなる。さらに、請求項１１にかかる発明によれば、同様の効果を奏する画像粗認識方法を提供でき、請求項１２にかかる発明によれば、画像粗認識プログラムを記録した媒体を提供できる。

【００３３】さらに、請求項１３にかかる発明によれ

ば、このような粗認識を利用して全体的な画像認識を効率よく行うことが可能な画像認識装置を提供することができ、請求項１４にかかる発明によれば、複写を禁止されているようなものを効率よく排除することが可能なカラー複写装置を提供することができる。

【００３４】

【発明の実施の形態】以下、図面にもとづいて本発明の実施形態を説明する。図１は、本発明の一実施形態にかかる画像粗認識装置を適用したカラー複写装置を外観斜視図により示している。

【００３５】本カラー複写装置１０は、カラースキャナ２０と、コピーサーバ３０と、カラープリンタ４０とから構成されており、コピーサーバ３０による制御に基づいてカラースキャナ２０にてカラー画像を読み込むと、読み込まれた画像データを当該コピーサーバ３０が画像処理して印刷データを生成し、この印刷データに基づいてカラープリンタ４０がカラー印刷する。図２はカラースキャナ２０の概略構成を示しており、フラットベッドタイプを採用している。被複写物を載置する透明板材２１の下方には照明ランプ２２とラインセンサ２３とが往復スライド移動可能に支持されるとともに、これらを駆動するための駆動ベルト２４ａとプーリ２４ｂと駆動モータ２４ｃとが配置され、制御回路２５に接続されている。カラー画像を読み込むときには、制御回路２５からの制御信号に基づいて照明ランプ２２が点灯すると、透明板材２１を介して被複写物を照明するので、同被複写物からの反射光が同透明板材２１を介してラインセンサ２３に照射される。ラインセンサ２３には光の三原色に対応するフィルタとＣＣＤ素子とが一色につき一列、通常三列配置されており、この三列のＣＣＤ素子により被複写物の幅方向にわたる一列分の色配置を読み込み、画像データとして出力する。一方、制御回路２５は駆動モータ２４ｃを駆動させることにより、これらの照明ランプ２２とラインセンサ２４とを一体的に被複写物の長さ方向に向かって移動させ、微少距離分だけ移動せしめる毎にラインセンサ２３から画像データを取得して出力する。これにより、外部的には被複写物を幅方向に主走査しながら長さ方向に副走査し、二次元の画像データを生成していくことになる。

【００３６】図３はコピーサーバ３０を概略ブロック図により示している。同コピーサーバ３０は概略的にはコンピュータと同等であり、ＣＰＵ３１のバス３２に対してＲＡＭ３３とＲＯＭ３４と操作パネル３５とハードディスク３６とＩ／Ｏ３７とが接続されている。これらについては特に説明を要しないが、Ｉ／Ｏ３７を介してカラースキャナ２０やカラープリンタ４０が接続されている。また、ＲＯＭ３４には基本的な演算プログラムや変換テーブルが書き込まれており、ＣＰＵ３１はＲＡＭ３３をワークエリアとして使用しながら同基本プログラムを実行するし、必要に応じて変換テーブルを参照する。また、ハードディスク３６は主に読み込んだ画像データを蓄えるようなバッファとして使用したり、逐次更新されるプログラムなどを保存したりする場合に使用する。なお、二点鎖線で示すように後述する画像認識処理を実行する画像認識基板３８を備えても良く、この場合は全体のパフォーマンスを向上させるために画像データを記憶するハードディスク３６に対して直接アクセスして処理を進行させるようにしても良い。この他、操作パネル３５にはコピー開始ボタン３５ａであるとか、コピー枚数を入力するテンキー３５ｂなどの各種の操作ボタンとともに、操作情報を確認するための液晶表示器３５ｃなども備えられ、ＣＰＵ３１はバス３２を介して当該操作パネル３５の操作状況を監視可能となっている。

【００３７】図４はカラープリンタ４０の構成を概略的に示しており、記録紙上に対してドットマトリクス状に色インクを吐出して印字を行うインクジェット方式を採用している。より詳細には、三つの印字ヘッドユニット４１ａからなる印字ヘッド４１と、この印字ヘッド４１を制御する印字ヘッドコントローラ４２と、当該印字ヘッド４１を桁方向に移動させる印字ヘッド桁移動モータ４３と、印字用紙を行方向に送る紙送りモータ４４と、これらの印字ヘッドコントローラ４２と印字ヘッド桁移動モータ４３と紙送りモータ４４における外部機器とのインターフェイスにあたるプリンタコントローラ４５とから構成されている。

【００３８】このカラープリンタ４０は印字インクとして四色の色インクを使用するものであり、各印字ヘッドユニット４１ａにはそれぞれ独立した二列の印字ノズルが形成されている。供給する色インクは印字ノズルの列単位で変えることができ、この場合は図示左方の印字ヘッドユニット４１ａについては二列とも黒色インク（Ｋ）を供給し、図示右方の印字ヘッドユニット４１ａについては左列にマゼンタ色インク（Ｍ）を供給するとともに右列にイエロー色インク（Ｙ）を供給し、図示真ん中の印字ヘッドユニット４１ａについては左列にシアン色インク（Ｃ）を供給するとともに右列は不使用としている。なお、本実施形態においては、四色の色インクを使用しているが、三つの印字ヘッドユニット４１ａにおける二列の印字ノズルを最大限に利用して六色の色インクを使用することも可能である。この場合、シアンとマゼンタについては濃色インクと淡色インクとを使用するものとし、さらにイエローとブラックとを使用して合計六色とすることができる。

【００３９】本実施形態においては、このようなコピーサーバ３０を核とする専用のカラー複写装置１０として適用しているが、図５に示すようなカラースキャナ５１とカラープリンタ５２を備えたパソコン５３によってカラー複写システムを採用したとしても同様に実現できる。また、カラープリンタなどの出力装置を備えた場合における紙幣の偽造に適用できるとしても、基本的には

カラー画像データを取得して紙幣の有無を短時間に正確に行うという意味では画像認識装置としてパソコン５３だけでも実現できるし、その場合においてとりあえず画像データに紙幣の画像らしきものが含まれているか否かを判断するだけの画像粗認識装置として実現できることもいうまでもない。

【００４０】従って、適用分野としては画像データが送受信される通信経路にて画像粗認識装置や画像認識装置として介在させるだけでも有用である。また、逆の意味で本当に紙幣であるか否かを判断する場合にも利用可能であり、自動販売機や両替機においてお札認識装置として適用することもできる。図６はコピーサーバ３０が実行するカラー複写処理の概略をフローチャートにより示しており、以下、かかるカラー複写処理を基準に画像粗認識について説明する。本処理を概略的に説明すると、ステップ１１０ではコピーの開始操作を待機し、ステップ１２０～１４０では複写を禁止すべき画像が含まれていないか判断し、ステップ１５０～１８０では所定の画像が含まれていない場合に限って印刷を行うというものである。

【００４１】まず、複写を禁止すべき画像が含まれているか否かの判断について説明する。ステップ１１０にてコピー開始操作がされたと判断されると、ステップ１２０では画像データを読み込む処理を行う。具体的にはＣＰＵ３１が操作パネル３５の操作状況を監視し、コピー開始ボタン３５ａが押し下げられたことを検知すると、Ｉ／Ｏ３７を介してカラースキャナ２０に対して画像読み取り指令を送出する。すると、カラースキャナ２０の制御回路２５は照明ランプ２２を点灯させ、駆動モータ２４ｃにて駆動指令を出して同照明ランプ２２とラインセンサ２３とをスライド移動させる。そして、所定距離だけ移動するごとに制御回路２５はラインセンサ２３が読み取った画像についての画像データを受け取り、コピーサーバ３０に送信する。コピーサーバ３０の側では、この画像データをＩ／Ｏ３７を介して受け取り、一旦ハードディスク３６に記憶する。

【００４２】画像データを読み込んだら、ステップ１３０では紙幣認識用の低解像度の画像データを生成する。本カラースキャナ２０の読み取り解像度は、６００ｄｐｉ（ｄｏｔｓ　ｐｅｒ　ｉｎｃｈ）であり、粗認識にせよ詳細認識にせよこの解像度の状態のままでは扱うデータ量が多くなりすぎるし、僅かなずれによって識別し得なくなるので、５０ｄｐｉに低解像度化する。カラースキャナ２０において低解像度で読込可能な場合は低解像度で読み込んで紙幣認識を行った上で改めて高解像度で読み込むことも不可能ではないが、二度にわたって読み込む間に原稿を代えてしまうことも考慮して、高解像度で読み込んだ画像データについてコピーサーバ３０内で低解像度化するようにしている。６００ｄｐｉから５０ｄｐｉへ低解像度化するにあたっては、縦横１２画素ごとに１画素を間引きして抽出しても良いし、平均化する演算を行っても良い。なお、このような低解像度化は必ずしも５０ｄｐｉに限られるものではないことは当然であり、ハードウェア構成などによって６０ｄｐｉというように高解像度化することも可能である。

【００４３】図７はこの低解像度化の様子を示しており、以下の処理では５０ｄｐｉとした状態で４０×４０画素の小領域を処理単位とするとともに、この小領域について５画素毎に移動させていくため、幅方向については一度に５０ｄｐｉへ低解像度化するとともに長さ方向については４０画素分と移動領域として５画素分について低解像度化する。むろん、処理を進めるに連れて５画素分ずつ長さ方向について低解像度化する。なお、幅方向については５０ｄｐｉで５８５画素となっており、１１．７インチで約２９２．５mmの画像を表している。なお、先に長さ方向にわたって全て低解像度化してハードディスク３６中に蓄えるようにしてもよい。むろん、この移動量は４画素とか、３画素とか、２画素というように適宜増減させることは可能である。むろん、少なくすれば認識率が向上する反面、処理量が増えて認識時間がかかるという関係にある。また、小領域のサイズについても４０×４０画素に限定されるものではなく、増減可能である。

【００４４】ステップ１４０では低解像度化した画像データに基づいて図８と図９に詳細に示す紙幣認識ルーチンを実行するが、まず、図１０と図１１を参照して本実施形態で実施する画像認識の手法について簡単に説明する。従来の画像認識は、紙幣なら紙幣全体の画像データを予め取り込んでおき、カラースキャナ２０などから読み込まれた画像データに対してパターンマッチングさせて紙幣の画像を含むか否か判断していた。しかしながら、このようなパターンマッチングはわずかに傾いていれば一致しなくなるし、それに伴って回転させるなどの処理を行えば演算処理量が増えてしまうので、非現実的であった。

【００４５】これに対して、図１０に示すように紙幣のうちの特徴的な画像部分を３ヶ所選択し、それぞれ個別に一致を検出する。それぞれをブロックＢＬＫ１～ブロックＢＬＫ３と呼ぶとすると、検出結果はブロック毎にその位置を記憶していき、最後に検出されたブロック間で元の紙幣の場合における相対位置関係を調べる。図１１はその処理内容を示しており、元の紙幣ではブロックＢＬＫ１とブロックＢＬＫ２と距離Ｄ１を隔てて位置するとともにブロックＢＬＫ１とブロックＢＬＫ３とが距離Ｄ２を隔てて位置し、かつ、それぞれを結ぶ線分同士が角度θとなっているとする。従って、個別にブロック毎に位置を記憶した情報からそれぞれの相対位置関係を求め、紙幣の場合の位置関係が見出されれば紙幣の画像が含まれているものと判断する。なお、このような特徴的な画像部分の数は必ずしも３ヶ所に限られるものでは

なく、４ヶ所、５ヶ所というように増えていけば認識率は向上する。

【００４６】このような小領域について４０×４０画素の図柄をそのまま利用することも可能であるが、本実施形態においては、図１２と図１３に示すように別の観点からデータ加工を行っている。同図に示すのは、縦横４０画素あるのを、まず、２画素ずつまとめて２０列に分け、さらに、縦方向と横方向に各列を集計する。縦方向に集計すると、横方向に独立した２０個の代表値が演算されるし、横方向に集計すると、縦方向に独立した２０個の代表値が演算される。以下、これらの代表値をｘ（０）～ｘ（１９）、ｙ（０）～ｙ（１９）として参照する。

【００４７】このように代表値を選択する手法は図柄の回転に対して極めて有効となる。図１４と図１５はこの回転処理に対する有効性を示す図である。特徴のある画像部分に限るとしても、紙幣がどの向きに配置されるかによって全方位に回転した画像データを備えておかなければならないことには変わりない。しかしながら、以上のような代表値を利用することにすると、３６０度の全方位について図１５に示すように４象限に分離した上で１象限内で回転させたパターンデータだけを備えておけばよくなる。図１４には１象限内を６等分して回転させている。これらをパターンデータＰ（０）～Ｐ（５）と呼ぶとすると、代表値をとることによってそれぞれの列方向については上下が逆になってもパターンデータＰ（０）～Ｐ（５）は不変である。従って、第１象限内では回転角度が進むに連れてパターンデータＰ（０）～Ｐ（５）と変化していくが、第２象限内では回転角度が進むに連れてパターンデータＰ（５）～Ｐ（０）と変化していき、以下、第３象限内ではパターンデータＰ（０）～Ｐ（５）と変化し、第４象限内ではパターンデータＰ（５）～Ｐ（０）と変化していくだけである。従って、１象限内だけのパターンデータＰ（０）～Ｐ（５）と比較するだけで一致するか否かを判断できる。

【００４８】一方、４０×４０画素まで小領域化するだけでも演算量が低下するものの、１画素分ずつ小領域を移動させてパターンデータを比較していてはまだまだ演算処理量が多くなる。このため、５画素分ずつ小領域を移動させて行くことにするが、これに対応して予め用意するパターンデータにも加工を施しておく。図１６はこの加工を示すものであり、５画素分の移動範囲内でできるだけ一致しやすくなるように、予め縦横方向（ｘ方向、ｙ方向）に小領域をずらせた場合のパターンデータを平均化しておく。このようにすれば、読み込んだ画像データの中の小領域が完全にパターンデータと一致することは無くなるものの、５画素分のずれの範囲内では概ね一致する判断結果を得やすくなるはずである。なお、この例では中心から上下左右にそれぞれ２画素分ずつ移動した範囲で５画素分のずれをカバーできる。

【００４９】このようにして４０×４０画素の小領域について、縦横２０個ずつの代表値を算出する処理が図８に示すステップ２２５の詳細認識特徴量算出処理であり、これをパターンデータにおける縦横２０個ずつの代表値と比較して一致するか否かを判断する処理がステップ２３０の詳細認識類似度算出処理である。この詳細認識類似度処理では縦横２０個ずつという計４０個の独立した代表値のずれを客観的に判断せざるを得ないため、類似度ｆを次式のように算出する。

【数１】

$$f=\sum_{i=0,19}\left[\{Px(i)-x(i)\}^{**}2+\{Py(i)-y(i)\}^{**}2\right]$$

なお、Ｐｘ（ｉ），Ｐｙ（ｉ）はパターンデータについての代表値である。

【００５０】しかしながら、この演算は、二乗演算が多数繰り返されるため、実際には時間がかかる。特に、自動販売機での紙幣のチェックのように、殆どの場合に紙幣が入っているなら許容度も大きくなるが、カラー複写装置１０の場合は大多数の場合に紙幣などは入っていないにも関わらずに演算時間をとられているようでは、作業者における事務処理などの効率を悪化させてしまう。ここにおいて、本実施形態のような粗認識を行うようにする意味が生じる。すなわち、ステップ２１０とステップ２１５にて読み込んだ画像データの中に紙幣の画像が含まれる可能性があるか否かを低精度でも構わないから短時間で判断し、殆どの場合には紙幣がないものとして上述した精度の高い類似度演算を省略することにする。図１７は粗認識を行うための特徴量を算出する処理をフローチャートにより示している。

【００５１】粗認識について説明する前に、ステップ２０５のヒストグラムイコライゼーションについて説明する。このヒストグラムイコライゼーションは読み込んだ画像データの輝度を補正するものである。例えば、流通している紙幣は汚れ、カラースキャナ２０で読み込んだときには新札の時から比べるとすすけて暗い画像になっている可能性が高い。また、単に暗いというよりはコントラストの幅が狭くなっていることも考えられるし、さらにはカラースキャナ２０の特性によっても偏りが生じているかもしれない。図１８は４０×４０画素の小領域を生成したときにおける各画素の輝度を集計してパレート図に表したものである。汚れのない紙幣について同図（ａ）に示すような分布になったとし、流通している紙幣についてのパレート図が同図（ｂ）や同図（ｃ）であったとする。同図（ｂ）に示すものでは全体的にコントラストの幅が狭まっているものの分布の形状は似ていることが見てとれるし、同図（ｃ）に示すものでは全体的

に暗くなっているものの分布の形状は似ていることが見てとれる。すなわち、汚れなどによっては輝度は影響を受けるものの分布の特徴自体はさほど影響を受けないのである。従って、分布の最低輝度ｙｍｉｎと最高輝度ｙｍａｘを検出し、その幅が最低輝度「０」～最高輝度「２５５」の範囲で均等に広がるように輝度調整するのがヒストグラムイコライゼーションの概略である。

【００５２】図１９と図２０はこの変換の様子を示しており、

ｙ’＝ａｙ＋ｂ

という変換式でパラメータａ，ｂを決定し、あらかじめ輝度ｙのとりうる範囲で正規化輝度ｙ’への変換テーブルを作成しておけばよい。なお、本実施形態においては画像データがＲＧＢの階調値で入力されるため、輝度ｙを直接に得ることができないが、概略的に

ｙ＝（Ｒ＋Ｇ＋Ｂ）／３

で置き換えて利用する。また、以下においてはこのように正規化した輝度を基準として処理を進める。

【００５３】図１７に示す粗認識特徴量算出処理に戻るが、この粗認識では輝度のメジアンと、二種類の色差を利用する。最初に、ステップ３１０では１６００画素を対象として輝度のメジアンｙｍｅｄを決定する。メジアンはパレート図において８００画素が含まれる輝度である。次に、ステップ３２０では１６００画素において輝度（Ｉ）と赤成分（Ｒ）の差分である色差１（Ｉ－Ｒ）を求めるとともに、上述した代表値として各列毎に平均化し、さらにｘ（０）～ｘ（１９）における分散値ＩＲＸｄｅｖとｙ（０）～ｙ（１９）における分散値ＩＲＹｄｅｖとを算出する。また、ステップ３３０では同様にして各画素毎に輝度（Ｉ）と緑成分（Ｇ）の差分である色差１（Ｉ－Ｇ）を求めるとともに、上述した代表値として各列毎に平均化し、さらにｘ（０）～ｘ（１９）における分散値ＩＧＸｄｅｖとｙ（０）～ｙ（１９）における分散値ＩＧＹｄｅｖとを算出する。そして、ステップ３４０では同様の処理を輝度について行い、分散値ＩＸｄｅｖ，ＩＹｄｅｖを算出する。

【００５４】このようにすると、粗認識では４０×４０画素の領域に関して６つの分散値ＩＲＸｄｅｖ，ＩＲＹｄｅｖ，ＩＧＸｄｅｖ，ＩＧＹｄｅｖ，ＩＸｄｅｖ，ＩＹｄｅｖとメジアンｙｍｅｄとで７つの特徴量が得られることになる。色差に関する特徴量は紙幣の色調の変化度合いを反映する意味が大きい。例えば、色差であれば輝度との差であるので汚れの影響を受けにくい。輝度の影響をなくす意味では、図２１に示すようなＬ＊ｕ＊ｖ＊表色系などのように、明度指数Ｌ＊とクロマティクネス指数ｕ＊ｖ＊とが完全に分離している座標系を利用すると、ほぼ紙幣の汚れなどの影響を受けないで色調を判断することができるようになる。また、図２２に示すように簡易的な変換によって輝度の影響を受けにくくした座標系などを利用するものであっても良い。

【００５５】本実施形態においては、色差を利用しつつもその分散値を利用することになり、色調が違ったとしても同じ分散値となることがあり得る。ただ、分散値自体はバラツキを表すので、図柄の変化度合いを反映することができる。また、輝度自体の分散値も利用する。上述したように、色調が違うにも関わらず分散値が同じとなってしまうこともあり得るが、この場合でも輝度まで一致することは少ないと考えら得るからである。

【００５６】すなわち、以上の特徴量は、色調と図柄を共に判断する上では比較的利用しやすいものといえるが、逆に言えば必ずしもこれらに限定されるような要素でもない。例えば、色調という意味では、平均値と分散値を両方利用することによって緑っぽい紙幣を赤っぽい画像の中で見つけてしまうことはなくなる。なお、このようにして特徴量を算出する作業が（第一の）検索情報取得手段を構成するとえいる。

【００５７】一方、このようにして算出した特徴量を使ってステップ２１５では本来の紙幣から得られるデータベースを参照しつつ類似度をチェックする。図２３はこのデータベースの構造を示している。本実施形態においては、複数の紙幣を検出可能としており、各紙幣毎にＩＤを付してある。また、各紙幣毎に３ヶ所を認識用のブロックとして設定し、さらに各ブロックを６方向に回転したパターンデータについて上述した６つの分散値ＩＲＸｄｅｖ，ＩＲＹｄｅｖ，ＩＧＸｄｅｖ，ＩＧＹｄｅｖ，ＩＸｄｅｖ，ＩＹｄｅｖとメジアンｙｍｅｄの上限値を下限値を用意してある。

【００５８】この類似度のチェックでは上述したような図柄のチェックの場合とは異なり、単に上限値と下限値との間にそれぞれの特徴量が含まれるか否かだけを判断する。これにより、二乗演算などを要しなくなり、演算量が低減する。また、全ての特徴量が範囲内に入る場合に限るようにすれば、各項目毎に上限値と下限値とをソートしておくことにより、極めて短時間に類似度の高いものか否かを判断することができる。すなわち、第１のソートキーとして色差１の分散値ＩＲＸｄｅｖに対する上限値を、第二のソートキーとして同下限値をというようにしてソートしておけば、６つの分散値について順番に範囲に含まれるかどうかを調べていき、一つでも範囲外になったら打ち切ればよいし、その比較自体が極めて容易である。なお、このデータベースは（第一の）記憶手段を構成すると言える。

【００５９】この類似度のチェック結果をステップ２２０にて判断し、類似するときにだけ上述したステップ２２５，２３０にて詳細認識を行う。従って、このステップ２２０の判断は（第一の）判定手段を構成していると言える。図２４は詳細認識のための代表値を記憶するデータベース構造を示している。詳細認識で利用する代表値は各列毎の輝度の平均値である。正規化した輝度を利用して代表値ｘ（０）～ｘ（１９），ｙ（０）～ｙ（１

９）を算出すれば、白黒の図柄としてパターンの一致を判断できる。なお、この意味での代表値の取得が第二の検索情報取得手段を構成すると言える。むろん、完全を期すために白黒では不十分という例もあるだろうが、どこに画像があるか分からない時点でそこまで調べる必要はない。完全を期すだけなら、この後の判断を加えて紙幣の位置が確実に判定できるようになった時点でカラー画像を再考察すればよいからである。

【００６０】ステップ２３０では類似度ｆが求められるから、ステップ２３５にてしきい値と比較し、類似すると言えるか否かを判断する。そして、類似する場合にはステップ２４０にて類似するデータとして別領域に記憶する。ここで記憶しなければならないのは、図２４で示すような紙幣ＩＤとブロックＩＤと回転ＩＤである。どの紙幣の、どこのブロックが、どの回転状態で検出されたかということを記憶していく。むろん、この比較の判断が第二の判定手段を構成すると言える。

【００６１】類似する場合もしない場合も、ステップ２４５で４０×４０画素の小領域を５画素分だけ移動する。以下、カラースキャナ２０から読み込んだ画像データについて幅方向及び長さ方向にこの対象ブロックたる小領域を移動させていき、ステップ２５０にて全て終了されたと判断されるまで繰り返す。全てのブロックについて終了したときには、類似するデータとして記憶されているのは図２５に示すような情報である。この図では分かりやすいように小領域の位置を明示しながら紙幣ＩＤとブロックＩＤと回転ＩＤを示しているが、実際には各ＩＤとともに対象ブロックの位置情報が付されているだけである。

【００６２】図９に示すステップ２５５では最初に紙幣認識フラグをオフにしておく。この紙幣認識フラグは最後に参照してオンとなっていれば紙幣の画像が含まれていたということを示すものであり、いわばこの時点で初期化しておくことになる。次のステップ２６０では類似する対象ブロックについて各ＩＤでソートする。すなわち、異なる紙幣の類似データがあっても無関係であるし、同じ紙幣であっても回転角度が異なるもの同士は意味を持たないからである。ステップ２６５では同じ紙幣であるとともに同じ回転角度となるものを対象として三つのブロックの組合せ候補を作成する。三つのブロックの組合せが見つかれば少なくとも一つの紙幣の候補となり得るから、ステップ２７０ではブロックの間隔と角度を算出する。図２５に示す例で言えば、紙幣ＩＤが「１」のものについて回転ＩＤが「１」となって共通するものが三つあり、それらのブロックＩＤが「１」～「３」というように三つのブロックの組合せとなっている。従って、ブロックＩＤが「１」と「２」であるブロック間の間隔Ｄ１と、ブロックＩＤが「１」と「３」であるブロック間の間隔Ｄ２とを算出するとともに、角度θを算出するのである。

【００６３】ステップ２７５ではこのように算出した間隔Ｄ１，Ｄ２と角度θが各紙幣のものとして登録されているものであるか否かをデータベースを参照して判断する。このデータベースの構造を図２６に示すが、各紙幣について一つの間隔Ｄ１，Ｄ２と角度θとが登録されているだけである。各対象ブロック毎には先行して一致度を見ているから、このデータベースではそれらの位置情報だけ、すなわち配置構造だけの情報だけで十分だからである。むろん、このデータベースが第二の記憶手段を構成すると言える。

【００６４】なお、図２４や図２６に示す二つのデータベースは基本的に図柄の一致を判定するものであり、具体的な手法として本実施形態のように、小領域の図柄だけの一致をみる作業と、その一致結果から相対的な位置情報を利用して確認する作業とに分離しているに過ぎない。むろん、このようにすることによって演算処理量を低減させつつ、認識効率を向上させる効果が期待できる。例えば、図２５に示すように、紙幣ＩＤと回転ＩＤでグループ化したときには三つのブロックの組合せ自体を生成できないものも生じている。これは、小領域について更に上述した代表値の手法を取り入れたことによって図柄としては一致しないにも関わらず、代表値だけがたまたま近似した場合である。そして、これだけでは誤認識が生じるものの、他のブロックとの相対位置情報で絞り込みをかけることによって誤認識はほぼ無くなる。

【００６５】ステップ２７５にてデータベースを参照し、一致するものがあったときにはステップ２８５にて紙幣認識フラグをオンにしてこの紙幣認識ルーチンを終了してしまうが、一致するものがない場合にはステップ２６５に戻って別の組合せを検討する。そして、他の紙幣ＩＤや他の回転ＩＤで組合せが見つけられた場合にはそれらについてブロック間隔や角度を算出してデータベースを参照する。次候補が無くなるか一致したものがあった場合には図６に示すメインルーチンにおけるステップ１４０の紙幣認識ルーチンを終了したことになる。すると、ステップ１５０では紙幣があったか否かを上述した紙幣認識フラグに基づいて判定する。紙幣が認識されなかった場合には、ステップ１６０にてハードディスク３６から高解像度の画像データを読み込み直し、ＲＧＢの表色空間からカラープリンタ２０の表色空間へと色変換する。続いて、ステップ１７０ではハーフトーン処理する。すなわち、同カラープリンタ２０における表現階調は色インクを付すか否かの２階調に過ぎず、２５６階調から２階調への階調変換がこのハーフトーン処理になる。なお、これらの色変換やハーフトーン処理については通常の技術を適用すればよく、敢えて説明しない。そして、生成されたＣＭＹＫ２階調の画像データを印刷データとしてＣＰＵ３１はＩ／Ｏ３７を介してカラープリンタ４０に出力する。

【００６６】カラープリンタ４０では印刷データはプリ

ンタコントローラ４５に入力され、同プリンタコントローラ４５は図示しない印字ヘッドバッファに対して所定の形式で書き込んでいき、印字ヘッド４１の一回分の走査に対応するデータが蓄積された時点で印字ヘッドコントローラ４２に対してバッファ内容を出力し、印字ヘッド桁送りモータ４３にて印字ヘッド４１を桁送りしながら所定の色インク粒を吐出させて印刷を行わせる。また、一回分の走査が終われば紙送りモータ４４にて紙送りする。そして、これらを繰り返してカラースキャナ２０にて読み込まれた画像データは所定のデータ変換を経てカラープリンタ４０に送られ、必要部数分だけ複写印刷されることになる。

【００６７】一方、紙幣があったと判断された場合にはステップ１６０以下の処理を行わない。従って、紙幣が含まれているにもかかわらず、カラー印刷してしまうことはない。本実施形態においては、一切のカラー印刷を行わないようにしているが、対処方法は様々である。例えば、三つのブロックから紙幣の位置が分かるから、その部分だけ白抜きにして印刷してしまったり、わざと色を変えて印刷したり、「ＷＡＲＮＩＮＧ」などの文字を重ねて印刷するといった処理を行っても良い。

【００６８】ところで、上述した実施形態においては、殆どの処理をソフトウェアによって実現しているが、ハードウェア化することも可能である。図２７には、その一例として、粗認識のための特徴量導出処理回路をブロック図により示している。この例では、ＲＧＢ各色の階調値を表す信号を輝度データ変換部６１に入力すると、平均値としての輝度に変換し、ヒストグラムイコライゼーション部６２と二つの色差算出部６５，６６に出力する。ヒストグラムイコライゼーション部６２は上述したようなパレート図に基づく正規化をハードウェア的に実現するものであり、その結果に基づいて変換テーブル６３の内容が更新される。一方、二つの色差算出部６５，６６はハードウェア的に色差を算出するが、入力データが正規化する前のものであるので、変換テーブル６３の中身を参照して正規化された状態の色差を算出する。そして、輝度標準偏差算出部６４は変換テーブル６３の中身に基づいて輝度の標準偏差を算出するし、メジアン算出部６８はメジアンを算出するし、色差標準偏差算出部６７は色差についての標準偏差を算出する。なお、各標準偏差についてはｘ方向とｙ方向との二系統に分けて出力する。

【００６９】また、図２８はカラー複写装置全体をハードウェア化した場合のブロック図を示している。操作パネル７１はコピーボタンなどを備えており、コピー操作に基づいて対応する制御信号を生成する。制御信号はラインセンサ駆動部７２とラインセンサ７３に出力され、コピー操作であれば同ラインセンサ駆動部７２がラインセンサをスライド移動させ、同ラインセンサ７３は所定タイミングで画像データを出力する。この画像データはデータ補正部７４にて色補正され、画像バッファ７５に書き込まれる。色補正は機種毎の相違や図示しない照明ランプの経年変化に基づくラインセンサ７３の出力変化などを補正するものであり、マトリクス演算によって色補正する。

【００７０】画像バッファ７５は高解像度の状態で画像データを記憶しており、粗画像データ取得部７６は上述したような低解像度化を行いつつ色差や輝度の分散値やメジアンなどの特徴量を抽出する。この特徴量はもちろん色度に関する分布状況を表すものであり、粗画像データベース７７には予め紙幣の画像に基づく特徴量がデータベース化されており、粗画像データマッチング部７８は算出された特徴量に基づいて粗画像データベース７７を検索する。

【００７１】この検索の結果は詳細画像データマッチング部８２に入力されており、粗画像データの状態でマッチングしたといえるときに当該詳細画像データマッチング部８２は詳細画像データ取得部７９が低解像度化して生成した図柄に関する画像データを取得し、紙幣の画像に基づく図柄に関する画像データを記憶した詳細画像データベース８１を検索する。なお、この例でも、上述したように最初に小領域でマッチングする位置情報を記憶しておき、最後に相対位置情報から紙幣の有無を判断する。

【００７２】粗画像データマッチング部７８は画像データの全領域にわたって検索を終了したら詳細画像データマッチング部８２と複写禁止判定部８３に伝え、詳細画像データマッチング部８２は上述したように相対位置情報から紙幣の有無を判断する。その判断結果は同複写禁止判定部８３に出力され、紙幣が含まれる場合にはこの複写禁止判定部８３は複写制御部８４にその旨を伝えて複写を禁止させるが、紙幣が含まれていない場合には複写制御部８４は上記画像バッファ７５から高解像度の画像データを読み込み、カラー印刷部８５にカラー複写印刷させる。

【００７３】なお、上述した実施形態においては、カラー複写を禁止される例として紙幣だけについて説明しているが、株券であるとか、特定の私文書・公文書であるなど、その対象は特に限定されるものではない。また、複写が禁止されることを検出するのではなく、紙幣の種類を検出するような意味で利用しても構わない。さらに、上述したように小領域化した複数の位置のブロックでマッチングさせることにより、紙幣の一部が他の画像と重ねられていたり、紙幣同士を重ねてしまっている場合でも発見できることがある。

【００７４】このように、図柄に着目した画像認識を行う前に、主に色度に関する分布状況を表す特徴量を粗認識のために算出する（ステップ２１０）とともに、この特徴量に基づいてデータベースと比較して粗認識としての類似度を算出し（ステップ２１５）、類似すると判断

された場合にだけ（ステップ２２０）、図柄に関する詳細認識を行うようにしたため、低確率で混入しうる紙幣などを排除するために、常に詳細認識を行う必要が無くなり、処理時間などを高速化することができる。

【図面の簡単な説明】

【図１】本発明の一実施形態にかかる画像粗認識装置を適用したカラー複写装置の外観斜視図である。

【図２】同カラー複写装置におけるカラースキャナ部分の概略構成を示す図である。

【図３】同カラー複写装置におけるコピーサーバ部分のブロック図である。

【図４】同カラー複写装置におけるカラープリンタ部分の概略構成を示す図である。

【図５】本発明の画像粗認識装置を実現するコンピュータシステムの外観斜視図である。

【図６】カラー複写装置におけるメイン処理のフローチャートである。

【図７】画像データを低解像度化する様子を示す図である。

【図８】紙幣認識ルーチンのフローチャートである。

【図９】紙幣認識ルーチンのフローチャートである。

【図１０】紙幣認識において紙幣上の小領域部分を示す図である。

【図１１】紙幣認識において小領域の相対位置関係を示す図である。

【図１２】小領域についての代表値を算出するための説明図である。

【図１３】小領域についての代表値を算出するための説明図である。

【図１４】紙幣を回転させたときの小領域の相対回転状態を示す説明図である。

【図１５】紙幣を回転させたときの４像限でパターンデータが変化していく状態を示す説明図である。

【図１６】小領域を縦横方向にずらして平均化させる状況を示す図である。

【図１７】粗認識特徴量算出処理のフローチャートである。

【図１８】ヒストグラムイコライゼーションに使用する輝度のパレート図である。

【図１９】ヒストグラムイコライゼーションで輝度変換する変換グラフである。

【図２０】ヒストグラムイコライゼーションに使用する変換テーブルを示す図である。

【図２１】Ｌ＊ｕ＊ｖ＊表色空間のモデル図である。

【図２２】他の表色空間のモデル図である。

【図２３】粗認識で使用するデータベース構造を示す図である。

【図２４】詳細認識で使用するデータベース構造を示す図である。

【図２５】詳細認識でブロックの相対位置関係から紙幣

の有無を判断する様子を示す図である。

【図２６】詳細認識でブロックの相対位置関係を記憶するデータベース構造を示す図である。

【図２７】ハードウェアで粗認識の特徴量を取得するブロック図である。

【図２８】ハードウェアだけの構成例を示すカラー複写装置のブロック図である。

【符号の説明】

１０…カラー複写装置
２０…カラースキャナ
２１…透明板材
２２…照明ランプ
２３…ラインセンサ
２４…ラインセンサ
２４ａ…駆動ベルト
２４ｂ…プーリ
２４ｃ…駆動モータ
２５…制御回路
３０…コピーサーバ
３１…ＣＰＵ
３２…バス
３３…ＲＡＭ
３４…ＲＯＭ
３５…操作パネル
３５ａ…コピー開始ボタン
３５ｂ…テンキー
３５ｃ…液晶表示器
３６…ハードディスク
３６…ハードディスク
３８…画像認識基板
４０…カラープリンタ
４１…印字ヘッド
４１ａ…印字ヘッドユニット
４２…印字ヘッドコントローラ
４３…印字ヘッド桁移動モータ
４４…紙送りモータ
４５…プリンタコントローラ
５１…カラースキャナ
５２…カラープリンタ
５３…パソコン
６１…輝度データ変換部
６２…ヒストグラムイコライゼーション部
６３…変換テーブル
６４…輝度標準偏差算出部
６５，６６…色差算出部
６７…色差標準偏差算出部
６８…メジアン算出部
７１…操作パネル
７２…ラインセンサ駆動部
７３…ラインセンサ

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７４…データ補正部
７５…画像バッファ
７６…粗画像データ取得部
７７…粗画像データベース
７８…粗画像データマッチング部
７９…詳細画像データ取得部

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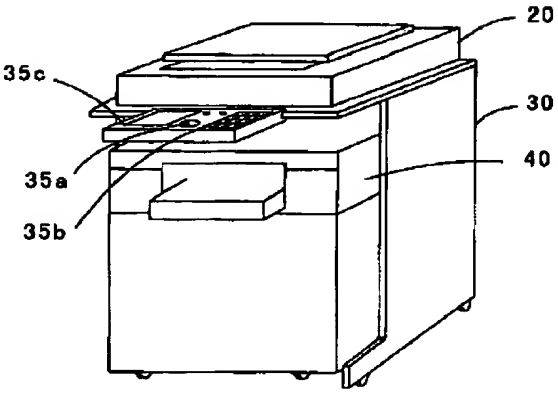
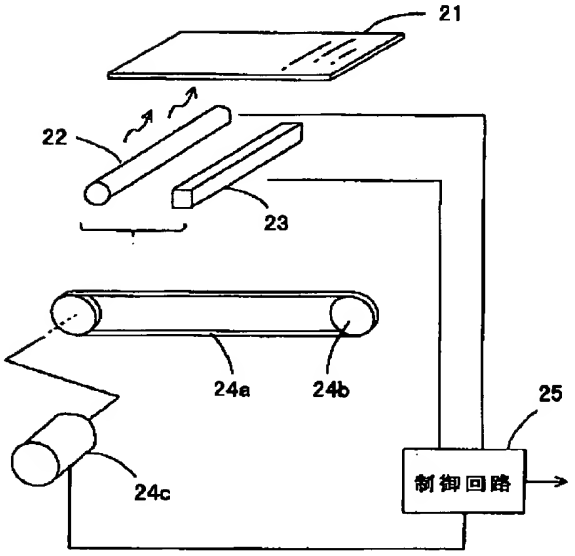
８１…詳細画像データベース
８２…詳細画像データマッチング部
８３…複写禁止判定部
８４…複写制御部
８５…カラー印刷部

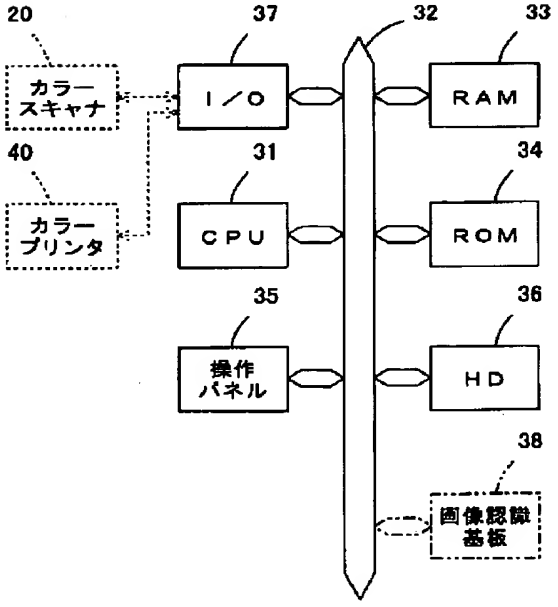
【図１】



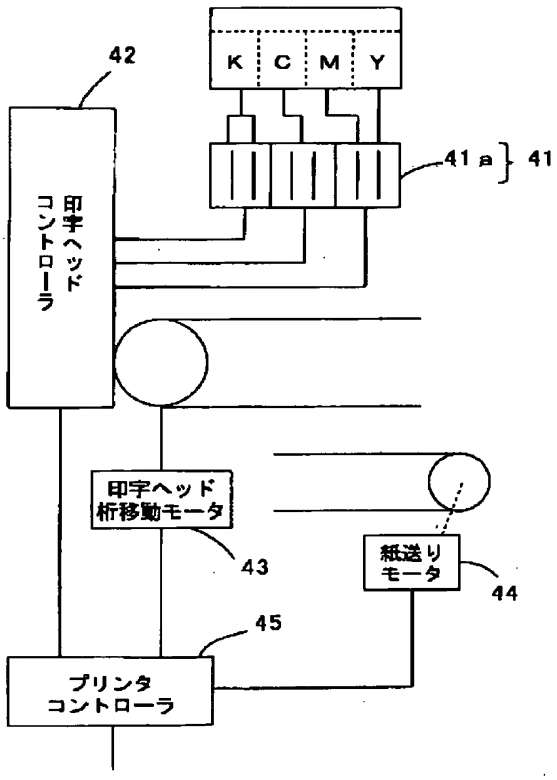
【図２】



【図３】



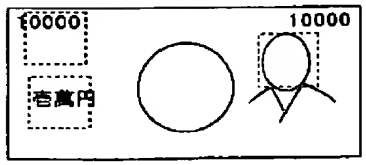
【図４】



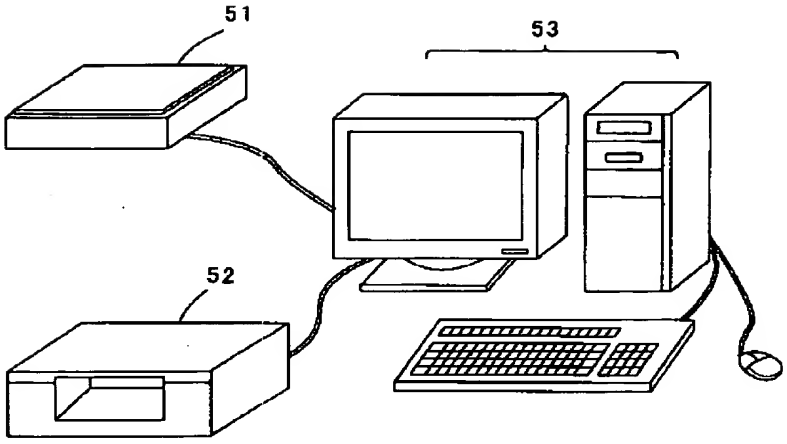
【図２０】

y	y'
0	0
1	0
2	0
ymin	1
	2
ymax	254
254	255
255	255

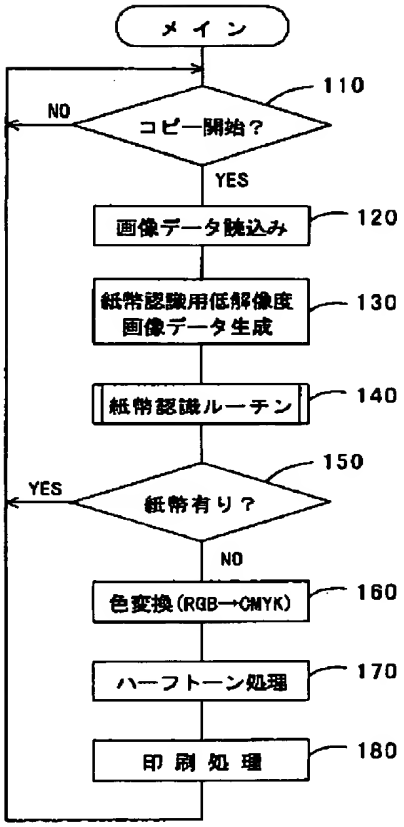
【図１０】



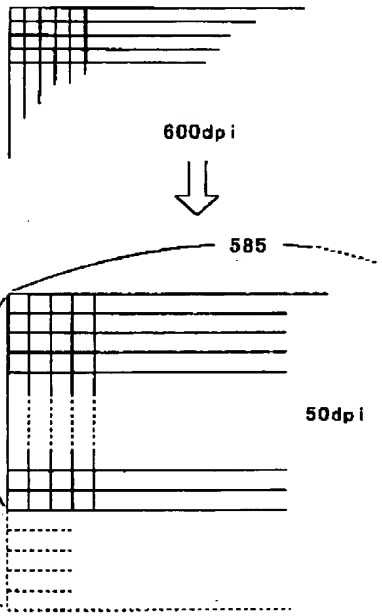
【図５】



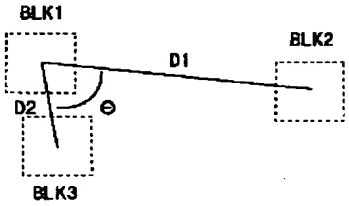
【図６】



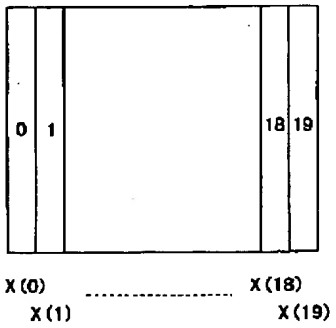
【図７】



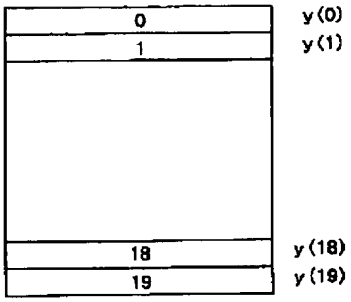
【図１１】



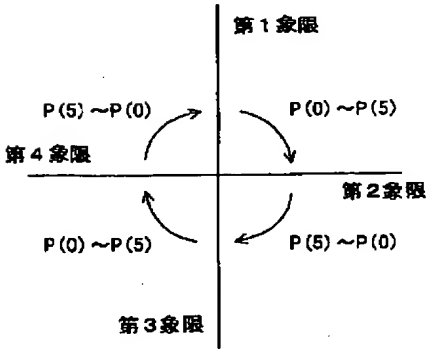
【図１２】



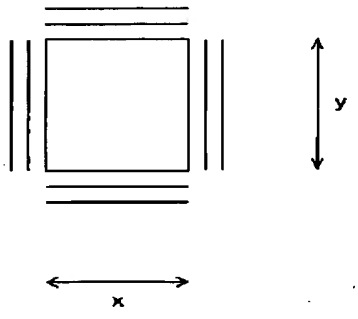
【図１３】



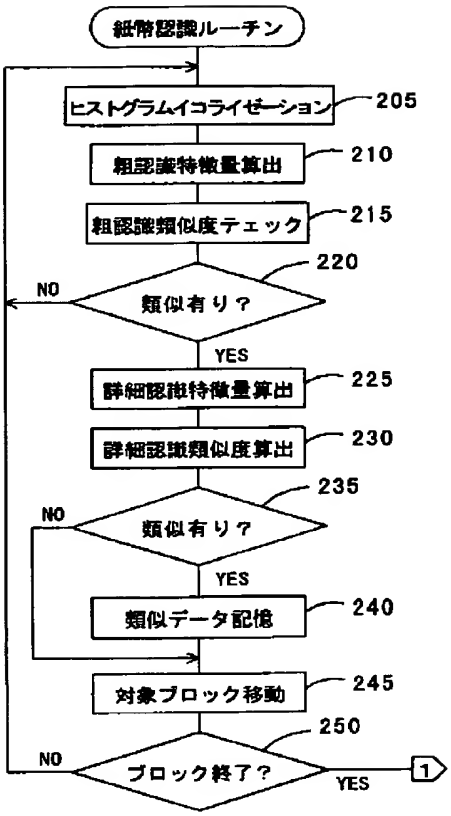
【図１５】



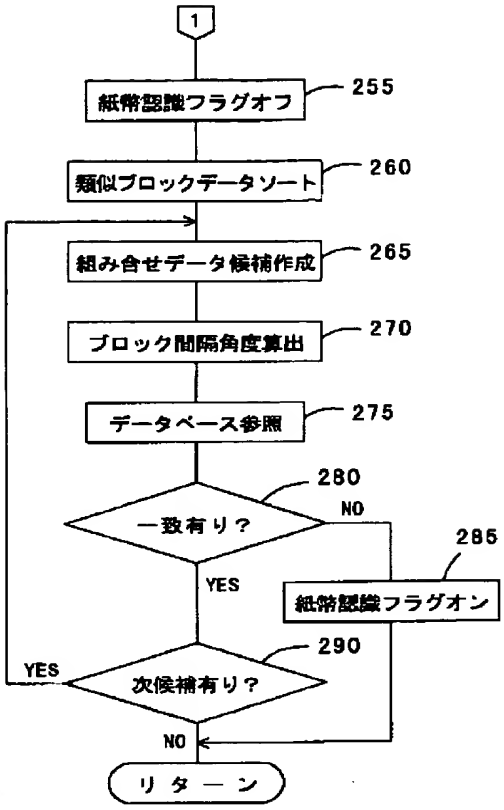
【図１６】



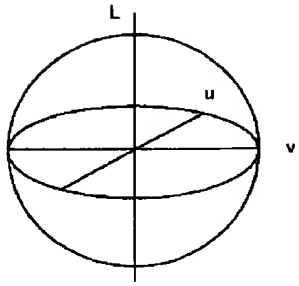
【図８】



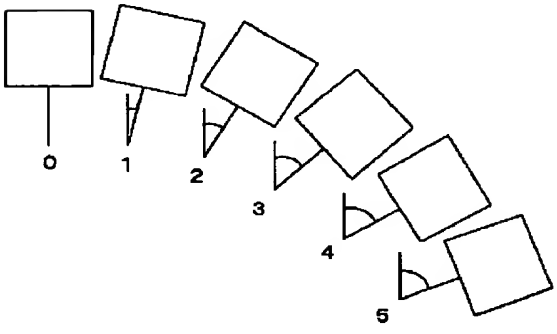
【図９】



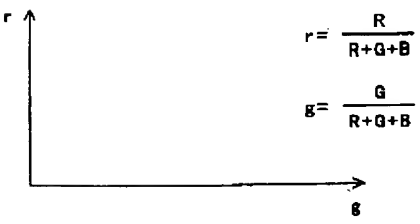
【図２１】



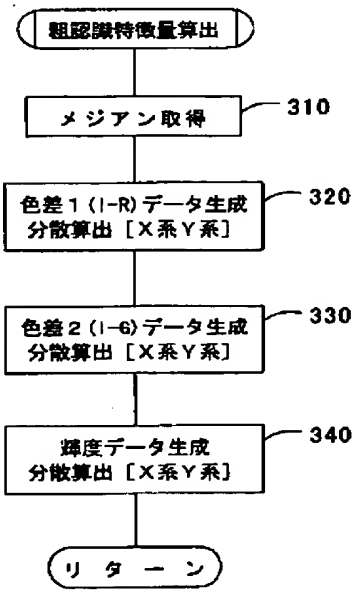
【図１４】



【図２２】



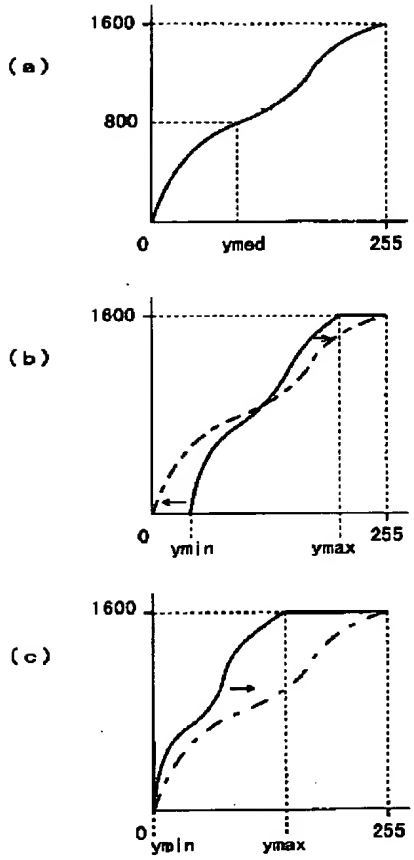
【図１７】



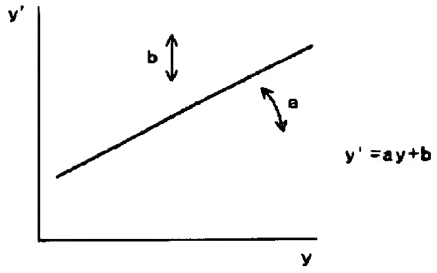
【図２６】

紙幣ID	D1	D2	Θ
1	5	2	60°
⋮			
N			

【図１８】



【図１９】



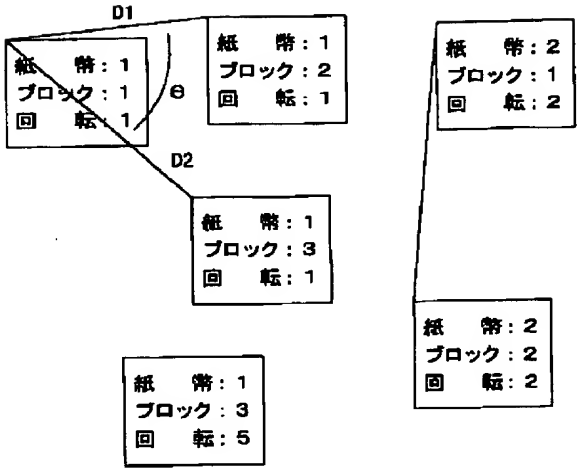
【図２３】

紙幣	1								2 -----
ブロック	1						2	3	
回転	1	2	3	4	5	6	1 ----- 6	1 ----- 6	
色差１：ＩＲＸｄｅｖ：上限									
色差１：ＩＲＸｄｅｖ：下限									
色差１：ＩＲＹｄｅｖ：上限									
色差１：ＩＲＹｄｅｖ：下限									
色差２：ＩＧＸｄｅｖ：上限									
色差２：ＩＧＸｄｅｖ：下限									
色差２：ＩＧＹｄｅｖ：上限									
色差２：ＩＧＹｄｅｖ：下限									
輝度：ＩＸｄｅｖ：上限									
輝度：ＩＸｄｅｖ：下限									
輝度：ＩＹｄｅｖ：上限									
輝度：ＩＹｄｅｖ：下限									
メジアン：ｙｍｅｄ：上限									
メジアン：ｙｍｅｄ：下限									

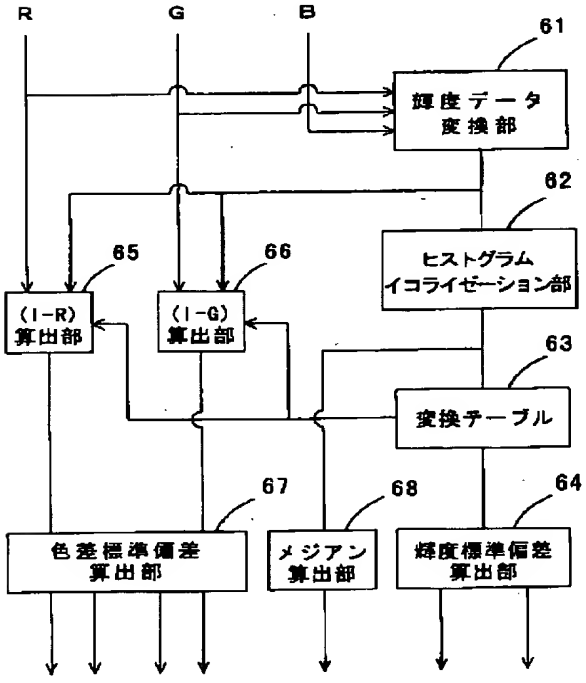
【図２４】

紙幣	1								2 ------
ブロック	1						2	3	
回転	1	2	3	4	5	6	1 ------ 6	1 ------ 6	
x (0)									
x (1)									
x (2)									
x (19)									
y (0)									
y (1)									
y (2)									
y (19)									

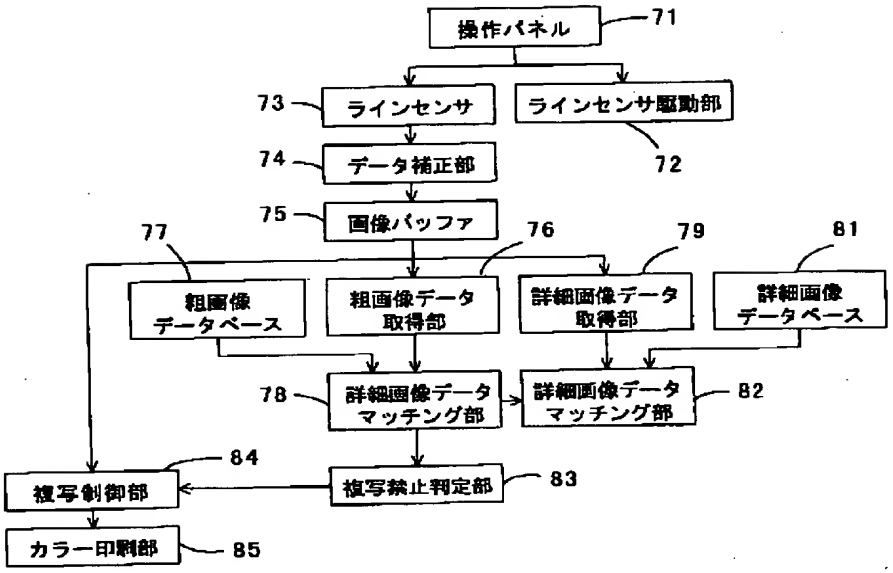
【図２５】



【図２７】



【図２８】


操作パネル
71
ラインセンサ
ラインセンサ駆動部
73
72
データ補正部
74
画像バッファ
75
77
76
79
81
粗画像
データベース
粗画像データ
取得部
詳細画像データ
取得部
詳細画像
データベース
78
詳細画像データ
マッチング部
詳細画像データ
マッチング部
82
84
複写制御部
複写禁止判定部
83
カラー印刷部
85

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3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The storage means which put the distribution situation in a predetermined small field mainly concerning a chromaticity in a database based on the image data of the specimen, An image data input means to acquire color picture data, and a retrieval information acquisition means to acquire the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, Image rough recognition equipment characterized by providing a judgment means to judge whether there is any thing applicable to the distribution situation which searched the database of the above-mentioned storage means based on this acquired distribution situation, and was acquired from the above-mentioned specimen.
[Claim 2] It is image rough recognition equipment characterized by being the value which the above-mentioned distribution situation classified the rectangle field into two or more trains in the lengthwise direction and the longitudinal direction in image rough recognition equipment given in above-mentioned claim 1, calculated central value about each train, and computed characteristic quantity about this central value.
[Claim 3] It is image rough recognition equipment characterized by the above-mentioned distribution situation being a variance based on the central value about each of this train, or its default reading in image rough recognition equipment given in above-mentioned claim 2.
[Claim 4] It is image rough recognition equipment characterized by using the default reading of the brightness which normalized the above-mentioned distribution situation in image rough recognition equipment given in either above-mentioned claim 1 - claim 3, or brightness.
[Claim 5] It is image rough recognition equipment characterized by the above-mentioned distribution situation being in the distribution situation about the color difference in image rough recognition equipment given in either above-mentioned claim 1 - claim 4.
[Claim 6] It is image rough recognition equipment characterized by the above-mentioned distribution situation being in the distribution situation about brightness in image rough recognition equipment given in either above-mentioned claim 1 - claim 5.
[Claim 7] It is image rough recognition equipment characterized by being that by which the above-mentioned characteristic quantity is obtained from two or more distribution situations in image rough recognition equipment given in either above-mentioned claim 1 - claim 6.
[Claim 8] It is image rough recognition equipment characterized by memorizing each above-mentioned distribution situation at the time of making it rotate at an angle of the plurality to which the above-mentioned storage means set spacing for the above-mentioned specimen in image rough recognition equipment given in either above-mentioned claim 1 - claim 7.
[Claim 9] It is image rough recognition equipment characterized by the above-mentioned retrieval information acquisition means extracting the distribution situation for the four quadrant which reflected object nature for every quadrant, the above-mentioned storage means memorizing the distribution situation in two or more angle of rotation which can be set at one quadrant in image rough recognition equipment given in above-mentioned claim 8.
[Claim 10] It is image rough recognition equipment which the above-mentioned storage means is equipped with the upper limit about the above-mentioned distribution situation, and a lower limit

in image rough recognition equipment given in either above-mentioned claim 1 - claim 9, and is characterized by judging whether the distribution situation that above-mentioned the acquisition of the above-mentioned judgment means was carried out enters between this upper limit and lower limit.

[Claim 11] While being the image rough recognition approach of judging whether the image of the specimen being contained in the color picture and creating the database of the distribution situation mainly concerning a chromaticity in a predetermined small field based on the image data of the above-mentioned specimen The image data input process which acquires color picture data, and the retrieval information acquisition process which acquires the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, The image rough recognition approach characterized by providing the judgment process which judges whether there is any thing applicable to the distribution situation which searched the above-mentioned database based on this acquired distribution situation, and was acquired from the above-mentioned specimen.

[Claim 12] It is the medium which recorded the image rough recognition program which judges whether the image of the specimen is contained in the color picture. While creating the database of the distribution situation mainly concerning a chromaticity in a predetermined small field based on the image data of the above-mentioned specimen The image data input step which acquires color picture data, and the retrieval information acquisition step which acquires the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, The medium which recorded the image rough recognition program characterized by providing the judgment step which judges whether there is any thing applicable to the distribution situation which searched the above-mentioned database based on this acquired distribution situation, and was acquired from the above-mentioned specimen.

[Claim 13] The first storage means which put the distribution situation in a predetermined small field mainly concerning a chromaticity in a database based on the image data of the specimen, The second storage means which put the pattern in this smallness field in a database, and an image data input means to acquire color picture data, The first retrieval information acquisition means which acquires the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, The first judgment means which judges [the second retrieval information acquisition means which acquires a pattern for every field of this, and] whether there is any thing applicable to the distribution situation which searched the database of the storage means of the above first based on this acquired distribution situation, and was acquired from the above-mentioned specimen, The database of the storage means of the above second is searched based on the pattern acquired with the retrieval information acquisition means of the above second when it was judged that there are some which correspond with this first judgment means. Image recognition equipment characterized by providing the second judgment means which judges whether there is any thing applicable to the pattern acquired from the above-mentioned specimen.

[Claim 14] The first storage means which put the distribution situation in a predetermined small field mainly concerning a chromaticity in a database based on the image data of the specimen, The second storage means which put the pattern in this smallness field in a database, and an image data input means to acquire the color picture data about a copied subject, The first retrieval information acquisition means which acquires the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, The first judgment means which judges [the second retrieval information acquisition means which acquires a pattern for every field of this, and] whether there is any thing applicable to the distribution situation which searched the database of the storage means of the above first based on this acquired distribution situation, and was acquired from the above-mentioned specimen, The second judgment means which judges whether there is any thing applicable to the pattern which searched the database of the storage means of the above second based on the pattern acquired with the retrieval information acquisition means of the above second when it was judged that there are some which correspond with this first judgment means, and was acquired from the above-mentioned specimen, The color reproducing unit

characterized by providing a printing prohibition means to forbid color printing by the above-mentioned color printing means when it is judged that there are some which correspond with the color printing means which color-prints based on the above-mentioned color picture data, and the judgment means of the above second.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to image rough recognition equipment, the image rough recognition approach, the medium that recorded the image rough recognition program, image recognition equipment, and a color reproducing unit.
[0002]
[Description of the Prior Art] It is becoming a technical problem how images which should be copied and which do not come out, such as a bill, should be forbidden along with the precision of a color reproducing unit improving. Judging whether the image of a bill is contained in the color picture which read digital processing by the intervening color reproducing unit aside from the thing using analog technology is proposed. In this case, the image data of a bill is memorized and pattern matching of the read color picture data and the image data of a bill is carried out.
[0003]
[Problem(s) to be Solved by the Invention] Although it is not technically impossible to carry out pattern matching of the read color picture data and the image data of a bill as proposed conventionally, it is difficult to practice. For example, the image consistency of extent which is equal to a copy is very high, and pattern matching of the image data of a bill is planned on this level because it becomes the immense amount of data. Moreover, dirt and a wrinkling also become a problem in many cases, and if it is going to carry out pattern matching to what is arranged aslant, the amount of operations will increase further.
[0004] Therefore, the technique of extent proposed from the former was unrealizable in fact. On the other hand, these people low-resolution-ized also about the read color picture data, and developed the technique of judging whether an image corresponding for every small field while they put three small fields in a bill in a database with the low resolution in view of such a situation. Although explained in full detail in the operation gestalt later mentioned about this technique, since it was what judges whether a pattern is in agreement about every small field even in this case, reduction-ization of the amount of operations was left behind as further purpose.
[0005] This invention was made in view of the above-mentioned technical problem, and in making it make it not copy a bill etc., it aims at offer of the image rough recognition equipment which can be enabled it to judge more for a short time, the image rough recognition approach, the medium which recorded the image rough recognition program, image recognition equipment, and a color reproducing unit.
[0006]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention concerning claim 1 The storage means which put the distribution situation in a predetermined small field mainly concerning a chromaticity in a database based on the image data of the specimen, An image data input means to acquire color picture data, and a retrieval information acquisition means to acquire the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, It has considered as the configuration possessing a judgment means to judge whether there is any

thing applicable to the distribution situation which searched the database of the above-mentioned storage means based on this acquired distribution situation, and was acquired from the above-mentioned specimen.

[0007] In invention concerning claim 1 constituted as mentioned above, if the distribution situation in a predetermined small field mainly concerning a chromaticity is put in a database based on the image data of the specimen with the storage means and color picture data are acquired with an image data input means, a retrieval information acquisition means will acquire the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field. Then, it judges whether a judgment means has a thing applicable to the distribution situation which searched the database of the above-mentioned storage means based on this acquired distribution situation, and was acquired from the above-mentioned specimen. Consequently, it can be said that possibility that the image of the specimen is contained in the color picture data read when there were some corresponding is high. What the storage means puts in a database is in the distribution situation in a small field mainly concerning a chromaticity, and can be said to be what expresses the color tone of the whole small field widely. That is, since there are many color tones of **** for every specimen, when the description can be found out to the color tone, it can be said that coincidence of a color tone is very effective. Of course, a color tone is not the semantics which eliminates the distribution situation of brightness etc. in a wide sense for the purpose of representing a pattern.

[0008] Although the distribution situation of a chromaticity can be searched for by various kinds of operations, considering distribution of a pattern, equalizing uniformly has a limitation in recognition effectiveness. For this reason, as an example showing distribution of a pattern, in image rough recognition equipment according to claim 1, the above-mentioned distribution situation classifies a rectangle field into two or more trains in a lengthwise direction and a longitudinal direction, invention concerning claim 2 calculates central value about each train, and it constitutes from a value which computed characteristic quantity about this central value. In invention concerning claim 2 constituted as mentioned above, first, the above-mentioned distribution situation classifies a rectangle field into two or more trains in a lengthwise direction and a longitudinal direction, and calculates central value about each train. Since the central value for two or more trains still exists in this condition next, characteristic quantity is computed based on this central value. Characteristic quantity here must not necessarily be one. However, what is necessary is making it just make it fluctuate according to need, in order for the possibility of incorrect recognition to also increase, while the rating of decision of little direction becomes less.

[0009] As an example which expresses a distribution situation with small characteristic quantity, invention concerning claim 3 consists of a variance based on the central value about each of this train, or its default reading for the above-mentioned distribution situation in image rough recognition equipment according to claim 2. In invention concerning claim 3 constituted as mentioned above, in order to use the variance showing the variation condition about central value of representing each train, when a distribution situation is expressed, it is convenient. Of course, variances may be default readings, such as standard deviation, in the same semantics.

[0010] Though the distribution situation of a chromaticity is mainly searched for, if a bill is made into an example, image data etc. may change with dirt, wrinklings, etc. easily. If premised only on the new note, it does not become useful at all. As an example of a cure to change of such image data, invention concerning claim 4 is considered as the configuration which uses the default reading of the brightness which normalized the above-mentioned distribution situation, or brightness in image rough recognition equipment according to claim 1 to 3.

[0011] In invention concerning claim 4 constituted as mentioned above, after normalizing the default reading of the brightness in image data, or brightness, it is used for a distribution situation. For example, when image data is expressed with the gradation value of the concentration of an element color, even if dirt is conspicuous on the whole and brightness will become low, it becomes easy to eliminate the effect of the existence of dirt by normalizing this. Brightness here can also be considered to be the brightness as one pixel which constitutes

image data, and can also consider the gradation value for every element color which constitutes one pixel to be brightness.

[0012] The distribution situation itself can specifically adopt various kinds of things that what is necessary is just mainly a thing about a chromaticity. As the example, the above-mentioned distribution situation consists of distribution situations about the color difference for invention concerning claim 5 in image rough recognition equipment according to claim 1 to 4. In invention concerning claim 5 constituted as mentioned above, it is because the distribution situation about the color difference is used, and this color difference has the property which is easy to use when seeing a color tone while it is not the component of only brightness.

[0013] Moreover, in image rough recognition equipment according to claim 1 to 5, the above-mentioned distribution situation consists of distribution situations about brightness for invention concerning claim 6 as other examples. The distribution situation about brightness is used in invention concerning claim 6 constituted as mentioned above. It is because distribution of a color bright as a distribution situation of a chromaticity and distribution of a dark color also have a useful property in the semantics of epicritic. Characteristic quantity does not necessarily need to be one kind of thing. In image rough recognition equipment according to claim 1 to 6, the above-mentioned characteristic quantity is obtained from two or more distribution situations, and invention concerning claim 7 consists of this semantics.

[0014] He is trying to obtain characteristic quantity from two or more distribution situations in invention concerning claim 7 constituted as mentioned above as it is in the distribution situation of the color difference, it is in the distribution situation of brightness or it is in other distribution situations. Abstracting like a distribution situation further also produces the facilities which do not remain only in rough recognition, not coming out of the specimen as a whole, and recognizing paying attention to a small field. As the example, invention concerning claim 8 is considered as the configuration which memorizes each above-mentioned distribution situation when the above-mentioned storage means rotates the above-mentioned specimen at an angle of the plurality which set spacing in image rough recognition equipment according to claim 1 to 7.

[0015] In invention concerning claim 8 constituted as mentioned above, the above-mentioned specimen was rotated at an angle of the plurality which set spacing, each above-mentioned distribution situation is memorized, and though it goes into the image data by which the bill etc. has been arranged aslant, what corresponds by searching a storage means with the distribution situation of the small field of a slanting condition can be found. This is based on the ability to be easy to find a match, though angle of rotation is shifted to some extent by being able to avoid that a storage region becomes huge and abstracting it like a distribution situation, even if it makes it rotate although it is a small field therefore.

[0016] Although 360 hands of cut will exist strictly, a distribution situation must not necessarily be prepared in an omnidirection. The above-mentioned retrieval information acquisition means is considered as the configuration which extracts the distribution situation for the four quadrant which reflected object nature for every quadrant, invention concerning claim 9 memorizing the distribution situation in two or more angle of rotation which can set the above-mentioned storage means to one quadrant in image rough recognition equipment according to claim 8 as the example.

[0017] In invention concerning claim 9 constituted as mentioned above, an omnidirection is divided into a four quadrant, a distribution situation is memorized with angle of rotation only about the one quadrant, and the amount of data is simply set to one fourth. Moreover, since the distribution situation for a four quadrant that the retrieval information acquisition means reflected object nature for every quadrant is extracted even if done in this way, it will judge completely like the case where it rotates about an omnidirection. In judging whether the distribution situation acquired from image data and the distribution situation acquired from the specimen correspond, various kinds of comparison approaches are employable. As that example, as for the above-mentioned storage means, invention concerning claim 10 is equipped with the upper limit about the above-mentioned distribution situation, and a lower limit in image rough recognition equipment according to claim 1 to 9, and the above-mentioned judgment means judges whether the distribution situation by which acquisition was carried out [above-

mentioned] enters between this upper limit and lower limit, and is constituted.
[0018] In invention concerning claim 10 constituted as mentioned above, the above-mentioned judgment means judges whether it enters between the upper limit of the distribution situation that the distribution situation by which acquisition was carried out [above-mentioned] is memorized with the above-mentioned storage means, and a lower limit. that is, by judging only size relation, data processing is boiled markedly and decreases. What is necessary is the situation each evaluation being adjusted arising, when using two or more distribution situations especially, but just coming to judge whether each going into the range, in using a upper limit and a lower limit.
[0019] Thus, the technique of judging whether based on the distribution situation in a small field mainly concerning a chromaticity, the image of the specimen is in image data does not necessarily need to be restricted to equipment with a stereo, and functioning also as the approach can be understood easily. For this reason, invention concerning claim 11 is the image rough recognition approach of judging whether the image of the specimen being contained in the color picture. While creating the database of the distribution situation mainly concerning a chromaticity in a predetermined small field based on the image data of the above-mentioned specimen The image data input process which acquires color picture data, and the retrieval information acquisition process which acquires the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, It has considered as the configuration possessing the judgment process which judges whether there is any thing applicable to the distribution situation which searched the above-mentioned database based on this acquired distribution situation, and was acquired from the above-mentioned specimen.
[0020] That is, there is no difference not only in the equipment which not necessarily has a stereo but in being effective as the approach. By the way, such image rough recognition equipment contains not only this but various kinds of modes as thought of that it may be used in the condition of existing independently and having been included in a certain device, and invention. Therefore, it can change suitably that it is software or hardware etc. When becoming the software of image rough recognition equipment as an example of embodiment of the thought of invention, naturally it exists on the record medium which recorded this software, and it must be said that it is used.
[0021] As the example, invention concerning claim 12 It is the medium which recorded the image rough recognition program which judges whether the image of the specimen is contained in the color picture. While creating the database of the distribution situation mainly concerning a chromaticity in a predetermined small field based on the image data of the above-mentioned specimen The image data input step which acquires color picture data, and the retrieval information acquisition step which acquires the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, It has considered as the configuration possessing the judgment step which judges whether there is any thing applicable to the distribution situation which searched the above-mentioned database based on this acquired distribution situation, and was acquired from the above-mentioned specimen.
[0022] of course, the record medium may be a magnetic-recording medium, may be a magneto-optic-recording medium, and can completely be considered the same way in any record media developed from now on. Moreover, about duplicate phases, such as a primary replica and a secondary replica, it is equivalent without room to completely ask. In addition, even when carrying out as the supply approach using a communication line, change and there is no this invention in an available thing. Furthermore, a part is software, when the part is realized by hardware, in the thought of invention, it does not differ at all, and you may consider as the thing of a gestalt which memorizes the part on the record medium and is read suitably if needed.
[0023] Such image rough recognition equipment does not judge the existence of images, such as a bill, certainly as itself, and if the image of the specimen is contained, utility value will produce it on the assumption that it takes over to a detailed inspection. In this case, it is also possible to also have image recognition equipment and a color reproducing unit separately from this image

rough recognition equipment and to become in one with these and to aim at improvement in effectiveness, although it is possible. First storage means by which invention concerning claim 13 put the distribution situation in a predetermined small field mainly concerning a chromaticity in a database based on the image data of the specimen, The second storage means which put the pattern in this smallness field in a database, and an image data input means to acquire color picture data, The first retrieval information acquisition means which acquires the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, The first judgment means which judges [the second retrieval information acquisition means which acquires a pattern for every field of this, and] whether there is any thing applicable to the distribution situation which searched the database of the storage means of the above first based on this acquired distribution situation, and was acquired from the above-mentioned specimen, The database of the storage means of the above second is searched based on the pattern acquired with the retrieval information acquisition means of the above second when it was judged that there are some which correspond with this first judgment means. It has considered as the configuration possessing the second judgment means which judges whether there is any thing applicable to the pattern acquired from the above-mentioned specimen.

[0024] In invention concerning claim 13 constituted as mentioned above, while putting the distribution situation in a predetermined small field mainly concerning a chromaticity in a database based on the image data of the specimen with the first storage means, the pattern in this smallness field is put in a database with the second storage means. Here, if an image data input means acquires color-picture data, it will judge [whether there is any thing applicable to the distribution situation that the first retrieval information acquisition means acquired the above-mentioned distribution situation from this read color-picture data for every field corresponding to the above-mentioned smallness field, searched the database of the storage means of the above first with the first judgment means based on this acquired distribution situation, and was acquired from the above-mentioned specimen, and]. A pattern acquires corresponding to this field, when it is judged that there are some which correspond with the first judgment means, on the other hand, the database of the storage means of the above second searches with the second retrieval information acquisition means based on the pattern from which the second judgment means was acquired with the retrieval information acquisition means of the above second, and it judges [whether there is any thing applicable to the pattern acquired from the above-mentioned specimen, and].

[0025] That is, it also enables it to have judged coincidence of a pattern about the same small field, and when coincidence of the distribution situation which can be called rough recognition is obtained, the judgment activity of coincidence of the pattern which requires time amount for an operation is made reduced by judging coincidence of a pattern, while judging the existence of the image of the specimen based on the distribution situation about a chromaticity for every small field. In this case, the judgment of a pattern is performed in a small field and judgment rating decreases also in this very thing.

[0026] Judging a pattern for every small field does not mean necessarily not judging the coincidence as the whole. That is, as long as coincidence in a small field is obtained, you may judge whether the image of the whole specimen is contained based on the information. In this case, the relative location of the image of a small field and the whole image should show the location of the whole image, and comparative rating is limited. Moreover, when coincidence of a pattern is judged and it is in agreement about two or more small [specimen / one] field, you may make it memorize the positional information. And finally both positional information is analyzed, and when in agreement with the relative-position relation of original small fields, it can be judged as that in which the image of the specimen is contained.

[0027] Furthermore, carrying out image recognition in this way can also be realized as a color reproducing unit, if an example is taken [that it is the purpose that the image of the specimen is made not to be copied, in many cases, and]. As such an example, invention concerning claim 14 The first storage means which put the distribution situation in a predetermined small field mainly concerning a chromaticity in a database based on the image data of the specimen, The second

storage means which put the pattern in this smallness field in a database, and an image data input means to acquire the color picture data about a copied subject, The first retrieval information acquisition means which acquires the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, The first judgment means which judges [the second retrieval information acquisition means which acquires a pattern for every field of this, and] whether there is any thing applicable to the distribution situation which searched the database of the storage means of the above first based on this acquired distribution situation, and was acquired from the above-mentioned specimen, The second judgment means which judges whether there is any thing applicable to the pattern which searched the database of the storage means of the above second based on the pattern acquired with the retrieval information acquisition means of the above second when it was judged that there are some which correspond with this first judgment means, and was acquired from the above-mentioned specimen, When it is judged that there are some which correspond with the color printing means which color-prints based on the above-mentioned color picture data, and the judgment means of the above second, it has considered as the configuration possessing a printing prohibition means to forbid color printing by the above-mentioned color printing means.

[0028] In invention concerning claim 14 constituted as mentioned above, since it will be judged that there are some which correspond with the judgment means of the above second when coincidence of a pattern is obtained after passing through rough recognition similarly, a printing prohibition means forbids color printing by the color printing means. Of course, in being usual [as which coincidence of a pattern is not regarded], a color printing means color-prints based on the above-mentioned color picture data.

[0029]

[Effect of the Invention] Image rough recognition equipment with possible this invention ceasing to compare the pattern which requires rating great when [almost all] such specimen is not contained by judging whether the image of the specimen is contained as rough recognition from the distribution situation in a small field mainly concerning a chromaticity, and raising the effectiveness as the whole, as explained above can be offered.

[0030] Moreover, since the distribution situation was searched for on the basis of the train classified in the direction in every direction according to invention concerning claim 2, it is easy to express a distribution situation and rating can also be lessened. Furthermore, according to invention concerning claim 3, since a variance is used, it is easy to express a distribution situation. Furthermore, according to invention concerning claim 4, it is hard coming to win popularity the effect of dirt etc. by normalizing brightness. Furthermore, according to invention concerning claim 5, the color difference used for a judgment can compute comparatively easily, and rating decreases.

[0031] Furthermore, according to invention concerning claim 6, since the general brightness itself is used, it is not necessary to newly calculate, and becomes in many cases, and rating decreases. Furthermore, according to invention concerning claim 7, it can judge synthetically from two or more distribution situations, and recognition effectiveness can be raised. Furthermore, according to invention concerning claim 8, in order to use the distribution situation in a small field, the amount of data becomes and the retrieval also becomes [setting up and putting two or more angle of rotation in a database beforehand] realistic easy.

[0032] Furthermore, according to invention concerning claim 9, correspondence in rotation of an omnidirection is attained, lessening capacity of a database. Furthermore, since it judges whether the range is set up and it enters between them by the upper limit and the lower limit according to invention concerning claim 10, the rating which decision takes decreases. Furthermore, according to invention concerning claim 11, the image rough recognition approach which does the same effectiveness so can be offered, and the medium which recorded the image rough recognition program can be offered according to invention concerning claim 12.

[0033] Furthermore, according to invention concerning claim 13, the image recognition equipment which can perform overall image recognition efficiently using such rough recognition can be offered, and the color reproducing unit which can eliminate efficiently what the copy is forbidden

can be offered according to invention concerning claim 14.
[0034]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. Drawing 1 shows the color reproducing unit which applied the image rough recognition equipment concerning 1 operation gestalt of this invention by the appearance perspective view.
[0035] This color reproducing unit 10 consists of a color scanner 20, a copy server 30, and a color printer 40, if a color picture is read with a color scanner 20 based on control by the copy server 30, the copy server 30 concerned will carry out the image processing of the read image data, it will generate print data, and a color printer 40 will color-print it based on these print data. Drawing 2 shows the outline configuration of a color scanner 20, and has adopted the flatbed type. the lower part of the transparence plate 21 which lays a copied subject -- the lighting lamp 22 and a line sensor 23 -- a both-way slide -- while being supported movable, driving-belt 24a, pulley 24b, and drive-motor 24c for driving these are arranged, and it connects with the control circuit 25. Since a copied subject will be illuminated through the transparence plate 21 if the lighting lamp 22 lights up based on the control signal from a control circuit 25 when reading a color picture, the reflected light from this copied subject is irradiated by the line sensor 23 through this transparence plate 21. The filter and CCD component corresponding to three primary colors of light read a single tier and the color arrangement for the single tier covering [triplex-row arrangement is usually carried out and] the cross direction of a copied subject by the CCD component of this triplex row into a line sensor 23 per Isshiki, and output to it as image data. On the other hand, by making drive-motor 24c drive, a control circuit 25 acquires and outputs image data from a line sensor 23, whenever it moves these lighting lamps 22 and line sensors 24 toward the die-length direction of a copied subject in one and you make it move by very small distance. Vertical scanning will be carried out in the die-length direction, carrying out horizontal scanning of the copied subject crosswise externally by this, and 2-dimensional image data will be generated.
[0036] Drawing 3 shows the copy server 30 with the outline block diagram. This copy server 30 is roughly equivalent to a computer, and RAM33, ROM34, a control panel 35, a hard disk 36, and I/O37 are connected to the bus 32 of CPU31. Although explanation is not required especially about these, the color scanner 20 and the color printer 40 are connected through I/O37. Moreover, a fundamental operation program and a fundamental translation table are written in ROM34, and CPU31 performs this basic program, using RAM33 as a work area, and refer to the translation table for it if needed. Moreover, a hard disk 36 is used, when using it as a buffer in which the mainly read image data is stored or saving the program updated serially. In addition, in order to have the image recognition substrate 38 which performs image recognition processing later mentioned as a two-dot chain line shows and to raise the whole performance in this case, direct access is carried out to the hard disk 36 which memorizes image data, and it may be made to advance processing. In addition, with various kinds of manual operation buttons which are copy initiation carbon button 35a, or input copy number of sheets into a control panel 35, such as ten key 35b, it has liquid crystal display 35c for checking actuation information etc., and CPU31 can supervise the actuation situation of the control panel 35 concerned through a bus 32.
[0037] Drawing 4 shows the configuration of a color printer 40 roughly, and has adopted the ink jet method which prints by breathing out color ink in the shape of a dot matrix to a record in the paper. Printer controllers 45 which are in charge of an interface with the external instrument in the print head 41 which consists of three print head unit 41a, the print head controller 42 which controls this print head 41, the print head shift motor 43 made to move the print head 41 concerned in the direction of a digit, the paper feed motor 44 which sends a print form to a line writing direction, these print head controllers 42 and the print head shift motor 43, and the paper feed motor 44 are consisted of more by the detail.
[0038] This color printer 40 uses the color ink of four colors as printing ink, and the printing nozzle of two trains which became independent, respectively is formed in each print head unit 41a. Can change the color ink to supply per train of a printing nozzle, and both trains supply

black ink (K) about print head unit 41a of an illustration left in this case. While supplying Magenta color ink (M) to a left column about print head unit 41a of the method of the illustration right, yellow color ink (Y) is supplied to a right column. While supplying cyanogen color ink (C) to a left column about print head unit 41a of illustration middle, the right column supposes un-using it. In addition, in this operation gestalt, although the color ink of four colors is used, it is also possible to use the color ink of six colors for the maximum using the printing nozzle of two trains in three print head unit 41a. In this case, about cyanogen and a Magenta, it can consider as a total of six colors further using yellow and black using dark color ink and light color ink.

[0039] In this operation gestalt, although applied as a color reproducing unit 10 of the dedication which uses such a copy server 30 as a nucleus, even if it adopts a color copy system with the color scanner 51 as shown in drawing 5 , and the personal computer 53 equipped with the color printer 52, it is realizable similarly. Moreover, though it is applicable to forgery of the bill at the time of having output units, such as a color printer Acquire color picture data fundamentally, can realize at least personal computer 53 as image recognition equipment for the purpose of performing existence of a bill for a short time correctly, and In that case, it cannot be overemphasized that it is also realizable as image rough recognition equipment which judges whether it sets, a bill makes [image] it image data for the time being, and the kimono is contained.

[0040] Therefore, it is useful to also make it intervene as image rough recognition equipment or image recognition equipment in the communication path by which image data is transmitted and received as Field of application. Moreover, also when judging whether it is a bill truly in reverse semantics, it is available, and in an automatic vending machine or a money-changing machine, it can also apply as tag recognition equipment. Drawing 6 shows the outline of the color copy processing which the copy server 30 performs with the flow chart, and explains image rough recognition on the basis of this color copy processing hereafter. If this processing is explained roughly, it will print only within the case where stand by initiation actuation of a copy at step 110, judge whether the image which should forbid a copy at steps 120-140 is contained, and the predetermined image is not contained at steps 150-180.

[0041] First, decision whether the image which should forbid a copy is contained is explained. If it is judged that copy initiation actuation was carried out at step 110, processing which reads image data will be performed at step 120. CPU31 specifically supervises the actuation situation of a control panel 35, and if it detects that copy initiation carbon button 35a was depressed, an image reading command is sent out to a color scanner 20 through I/O37. Then, the control circuit 25 of a color scanner 20 makes the lighting lamp 22 turn on, takes out a drive command with drive-motor 24c, and carries out slide migration of this lighting lamp 22 and the line sensor 23. And whenever only predetermined distance moves, a control circuit 25 transmits the image data about the image which the line sensor 23 read to reception and the copy server 30. In the copy server 30 side, this image data is received through I/O37, and it once memorizes to a hard disk 36.

[0042] If image data is read, at step 130, the image data of the low resolution for bill recognition will be generated. the reading resolution of this color scanner 20 is 600dpi (dots per inch), and make it rough recognition -- since the amount of data treated with the condition of the resolution beside detail recognition fake increases too much and it becomes impossible to identify by slight gap, it low-resolution-izes to 50dpi. It also takes into consideration also reading with high resolution anew, after it read with the low resolution when reading in a low resolution was possible, and performing bill recognition in a color scanner 20, and replacing a manuscript with, while reading over 2 times, although it is not impossible, andis [low-resolution-] made toize within the copy server 30 about the image data read with high resolution. In low-resolution-izing from 600dpi to 50dpi, 1 pixel may be operated on a curtailed schedule and extracted for 12 pixels of every direction, and the operation to equalize may be performed. In addition, naturally such low resolution-ization is not necessarily what is restricted to 50dpi, and it is also possible to high-resolution-ize like 60dpi by a hardware configuration etc.

[0043] Drawing 7 shows the situation of this low-resolution-izing, and in the following processings, while making a 40x40-pixel small field into a batch in the condition of having been

referred to as 50dpi, in order to make it move every 5 pixels about this small field, it low-resolution-izes [direction / die-length] about 5 pixels as 40 pixels and a migration field while it low-resolution-izes to 50dpi at once about the cross direction. Of course, it takes for advancing processing and every 5 pixels are low-resolution-ized about the die-length direction. In addition, about the cross direction, it is 585 pixels by 50dpi, and about 292.5mm image is expressed with 11.7 inches. In addition, all are previously low-resolution-ized covering the die-length direction, and you may make it store into a hard disk 36. Of course, as for this movement magnitude, it is possible like 4 pixels, 3 pixels, and 2 pixels to make it fluctuate suitably. Of course, if it lessens, while a recognition rate will improve, it has a relation that throughput increases and the recognition time starts. Moreover, also about the size of a small field, it is not limited to 40x40 pixels, and can fluctuate.

[0044] Although the bill recognition routine shown in a detail at drawing 8 and drawing 9 based on the low-resolution-ized image data is performed at step 140, the technique of the image recognition carried out with this operation gestalt with reference to drawing 10 and drawing 11 is explained briefly first. It judged whether if the conventional image recognition is a bill, it incorporates the image data of the whole bill beforehand, and it would be made it to carry out pattern matching to the image data read from the color scanner 20 etc., and it would contain the image of a bill. However, since the amount of data processing of pattern matching [such] increased when processing not being in agreement if it leans slightly, and making it rotate in connection with it etc., it was unreal.

[0045] On the other hand, as shown in drawing 10 , three characteristic image parts of the bills are chosen, and coincidence is detected according to an individual, respectively. Supposing it calls each block BLK1 - block BLK3, the detection result memorizes the location for every block, will be between the blocks detected at the end, and will investigate the relative-position relation in the case of the original bill. Drawing 11 R> 1 presupposes that the segments which show the contents of processing, block BLK1 and block BLK3 separate distance D2, and are located while separating distance D1 from block BLK1 and block BLK2 with the original bill and being located, and connect each serve as an include angle theta. Therefore, it asks for each relative-position relation according to an individual from the information which memorized the location for every block, and if the physical relationship in the case of a bill is found out, it will be judged as that in which the image of a bill is contained. In addition, if the number of such characteristic image parts is not necessarily restricted to three places and increases like four places and five places, a recognition rate will improve.

[0046] Although it is also possible to use a 40x40-pixel pattern as it is about such a small field, as shown in drawing 12 and drawing 13 , in this operation gestalt, data processing is performed from another viewpoint. First, being shown in this drawing summarizes that it is [2-pixel] at a time 40 pixels of every direction, it divides it into 20 trains, and totals each train in a lengthwise direction and a longitudinal direction further. If the central value of 20 pieces which became independent in the longitudinal direction when it totaled to the lengthwise direction calculates and it totals in a longitudinal direction, the central value of 20 pieces which became independent to the lengthwise direction will calculate. Hereafter, such central value is referred to as x(0) -x (19), y (0) - y (19).

[0047] Thus, the technique of choosing central value becomes very effective to rotation of a pattern. Drawing 14 and drawing 15 are drawings showing the effectiveness over this rotation processing. Though restricted to a characteristic image part, a bill is unchanging for it having to have the image data which rotated to the omnidirection by whether it is arranged at which sense. However, what is necessary is coming to have only pattern data rotated within 1 quadrant after separating into four quadrants, as the omnidirection of 360 degrees is shown in drawing 15 , if the above central value's will be used. The inside of 1 quadrant is equally divided to drawing 14 six, and it is made to rotate it. Supposing it calls these pattern data P (0) - P (5), even if the upper and lower sides become reverse about each direction of a train by taking central value, pattern data P (0) - P (5) are eternal. Therefore, although angle of rotation takes for progressing and changes with pattern data P (0) - P (5) within the 1st quadrant Within the 2nd quadrant, angle of rotation takes for progressing and it changes with pattern data P (5) - P (0), and

hereafter, within the 3rd quadrant, it changes with pattern data P (0) - P (5), and only changes with pattern data P (5) - P (0) within the 4th quadrant. Therefore, it can judge whether it is in agreement only by comparing with pattern data [only in 1 quadrant] P (0) - P (5).
[0048] On the other hand, although the amount of operations falls, if forming a small field to 40x40 pixels also moves every 1 pixel of small fields and it is comparing pattern data, the amount of data processing increases still more. For this reason, it is processed also into the pattern data beforehand prepared corresponding to this, although every 5 pixels of small fields will be moved and it will go. Drawing 16 shows this processing, and it equalizes the pattern data at the time of the ability to shift a small field in the direction (x directions, the direction of y) in every direction beforehand so that it is in the successive range for 5 pixels, and may be easy to be in agreement as possible and may become. If it does in this way, it becomes easy to obtain the decision result in agreement in general that the small field in the read image data is completely in agreement with pattern data within the limits of the gap for 5 pixels of what is lost. In addition, in this example, the gap for 5 pixels can be covered in the range in which it moved every 2 pixels vertically and horizontally from the core, respectively.
[0049] Thus, the processing which computes the central value of every 20 every direction about a 40x40-pixel small field is detail recognition characteristic quantity calculation processing of step 225 shown in drawing 8 , and the processing which judges whether it is in agreement as compared with the central value of every 20 every direction [in / for this / pattern data] is detail recognition similarity calculation processing of step 230. In this detail recognition similarity processing, since a total of 40 independent gaps of central value called every 20 every direction must be judged objective, Similarity f is computed like a degree type.
[Equation 1]

$$f = \sum_{i=0,19} [\{Px(i) - x(i)\}^{**2} + \{Py(i) - y(i)\}^{**2}]$$

In addition, Px (i) and Py (i) are the central value about pattern data.
[0050] However, since much square operations are repeated, this operation takes time amount in fact. Especially, like the check of the bill in an automatic vending machine, if the bill is contained in almost all cases, tolerance will also become large, but in the case of the color reproducing unit 10, effectiveness, such as paperwork in an operator, will be then worsened so that the operation time may be taken, although the bill etc. is not contained in a large majority of cases. In here, the semantics which is made to perform rough recognition like this operation gestalt arises. That is, since low precision is sufficient, it judges whether the image of a bill may be contained in the image data read at step 210 and step 215 for a short time, and a similarity operation with a high precision mentioned above as that where no bill is in almost all cases will be omitted. Drawing 17 shows the processing which computes the characteristic quantity for performing rough recognition with the flow chart.
[0051] Before explaining rough recognition, histogram IKORAIZESHON of step 205 is explained. This histogram IKORAIZESHON amends the brightness of the read image data. For example, the bill which is circulating has high possibility of being stained with soot if it compares from the time of a new note when it reads with dirt and a color scanner 20, and having become a dark image. Moreover, it may also be considered the width of face of contrast is narrow rather than only dark, and the bias may have arisen also with the property of a color scanner 20 further. Drawing 18 totals the brightness of each pixel when generating a 40x40-pixel small field, and expresses it to a pareto. It supposes that it became distribution as shown in this drawing (a) about a bill without dirt, and suppose that the paretos about the bill which is circulating were this drawing (b) and this drawing (c). By what can grasp that the configuration of distribution is alike although the width of face of contrast is narrow on the whole, and shows it in this drawing (c), although it is dark on the whole, it can grasp that the configuration of distribution is alike what is shown in this drawing (b). That is, although brightness is influenced with dirt etc., the description of distribution itself is not influenced so much. Therefore, what a brilliance control is carried out for so that the minimum brightness ymin of distribution and the highest brightness ymax may be detected and

the width of face may spread equally in the range of the minimum brightness "0" - highest brightness "255" is the outline of histogram IKORAIZESHON.
[0052] Drawing 19 and drawing 20 show the situation of this conversion, determine Parameters a and b by transformation called y'=ay+b, and should just create the translation table to normalization brightness y' in the range which brightness y can take beforehand. In addition, although brightness y cannot be directly obtained since image data is inputted with the gradation value of RGB in this operation gestalt, it replaces and uses by y= (R+G+B) / 3 roughly. Moreover, processing is advanced to below on the basis of the brightness normalized in this way.
[0053] Although it returns to the rough recognition characteristic quantity calculation processing shown in drawing 17 , in this rough recognition, the median of brightness and two kinds of color difference are used. First, at step 310, the median ymed of brightness is determined for 1600 pixels. A median is brightness in which 800 pixels is contained in a pareto. next -- as the central value mentioned above while searching for the color difference 1 (I-R) which is the difference of brightness (I) and a red component (R) in 1600 pixels at step 320 -- every train -- equalizing -- further x(0) - the variance IRXdev in x (19) and the variance IRYdev in y (0) - y (19) are computed. moreover -- as the central value mentioned above while searching for the color difference 1 (I-G) which is the difference of brightness (I) and a green component (G) for every pixel similarly at step 330 -- every train -- equalizing -- further x(0) - the variance IGXdev in x (19) and the variance IGYdev in y (0) - y (19) are computed. And at step 340, same processing is performed about brightness and Variances IXdev and IYdev are computed.
[0054] When it does in this way, in rough recognition, seven characteristic quantity will be obtained about a 40x40-pixel field with six variances IRXdev, IRYdev, and IGXdev, IGYdev, IXdev, IYdev, and a median ymed. The characteristic quantity about the color difference has the large semantics reflecting the change degree of the color tone of a bill. For example, since it is a difference with brightness if it is the color difference, it is hard to be influenced of dirt. In the semantics which loses the effect of brightness, if lightness-index L* and chromaticness-index u*v* use the system of coordinates separated completely like a L*u*v* color coordinate system as shown in drawing 21 , a color tone can be judged without being mostly influenced of the dirt of a bill etc. Moreover, as shown in drawing 22 , the system of coordinates which made effect of brightness hard to be influenced by simple conversion may be used.
[0055] In this operation gestalt, although the color difference is used, even if the variance will be used and a color tone is different, it can become the same variance. However, since the variance itself expresses variation, the change degree of a pattern can be reflected. Moreover, the variance of the brightness itself is also used. As mentioned above, although a color tone is different, a variance can become the same, but it is from idea **** that it is in agreement to brightness even in this case, when few.
[0056] That is, when judging a color tone and a pattern, it can be called what it is comparatively easy to use, but neither of above characteristic quantity will also not necessarily be the last element which would be limited to these, if it says conversely. For example, in the semantics of a color tone, finding the bill which will seemingly be green in a reddish image is lost by using both the average and a variance. In addition, when the activity which computes characteristic quantity by doing in this way constitutes a retrieval information acquisition means (the first), obtain and it is.
[0057] Similarity is checked referring to the database obtained from an original bill at step 215 using the characteristic quantity computed by having carried out in this way on the other hand. Drawing 23 shows this database structure. In this operation gestalt, two or more bills are made detectable and ID is attached for every bill. Moreover, three places are set up as a block for recognition for every bill, and the lower limit is prepared for the upper limit of six variances IRXdev, IRYdev, and IGXdev which mentioned each block above further about the pattern data which rotated in the six directions, IGYdev, IXdev, IYdev, and a median ymed.
[0058] Unlike the case of the check of a pattern which was mentioned above, with the check of this similarity, it judges whether each characteristic quantity is only contained between a upper limit and a lower limit. Thereby, it stops requiring a square operation etc. and the amount of operations decreases. Moreover, if it is made to restrict when all characteristic quantity goes

into within the limits, it can judge extremely whether it is the high thing of similarity by sorting the upper limit and the lower limit for every item in a short time. namely, a upper limit [as opposed to the variance IRXdev of the color difference 1 as the 1st sort key] -- as the second sort key -- this lower limit -- as -- if it sorts by carrying out, what is necessary is to investigate whether it is contained in the range in order about six variances, and just to close, if at least one becomes out of range, and the comparison itself is very easy. In addition, it can be said that this database constitutes a storage means (the first).

[0059] Detail recognition is performed at step 225,230 which judged the check result of this similarity at step 220, and was mentioned above only when similar. Therefore, it can be said that decision of this step 220 constitutes the judgment means (the first). Drawing 24 shows the database structure which memorizes the central value for detail recognition. The central value used by detail recognition is the average of the brightness for every train. If central value x(0) -x (19), y (0) - y (19) are computed using the normalized brightness, coincidence of a pattern can be judged as a monochrome pattern. In addition, it can be said that acquisition of the central value in this semantics constitutes the second retrieval information acquisition means. Of course, although the example that black and white are inadequate is probably also in a term ** sake about completeness, when it does not know where an image is, it is not necessary to investigate to there. If it is only term ** about completeness, it is because what is necessary is just to re-consider a color picture when next decision is added and the location of a bill can judge certainly.

[0060] At step 230, since Similarity f is called for, it judges whether it can be said that it is similar at step 235 as compared with a threshold. And in being similar, it memorizes to another field as data which are similar at step 240. It is Bill ID, Block ID, and Rotation ID which must be memorized here as shown by drawing 24 . The block of where of which bill memorizes [which] whether it was detected in the state of rotation. Of course, it can be said that decision of this comparison constitutes the second judgment means.

[0061] Also when similar and there is nothing, it moves by 5 pixels at step 245 in a 40x40-pixel small field. This object block slack smallness field is hereafter moved in the cross direction and the die-length direction about the image data read from the color scanner 20, and it repeats until it is judged that it was all ended at step 250. When it ends about all blocks, information as shown in drawing 25 is memorized as similar data. Although this drawing shows Bill ID, Block ID, and Rotation ID, showing clearly that the location of a small field is intelligible, the positional information of an object block is only attached with each ID in fact.

[0062] At step 255 shown in drawing 9 , the bill recognition flag is cleared first. This bill recognition flag will show that the image of a bill was contained, if it is ON with reference to the last, and so to speak, it will initialize it at this time. At the following step 260, it sorts by each ID about a similar object block. That is, it is because those from which angle of rotation differs do not have semantics even if it is unrelated even if there are similar data of a different bill, and it is the same bill. At step 265, while being the same bill, the combination candidate of three blocks is created for the thing used as the same angle of rotation. If the combination of three blocks is found, since it can become the candidate of at least one bill, spacing and the include angle of a block are computed at step 270. If it says in the example shown in drawing 25 , those with three and those blocks ID serve as combination of that in which Rotation ID is set to "1" and Bill's ID is common about the thing of "1" three blocks like "1" - "3." Therefore, while computing the spacing D1 during the block whose blocks ID are "1" and "2", and the spacing D2 during the block whose blocks ID are "1" and "3", an include angle theta is computed.

[0063] At step 275, it judges whether they are the spacing D1 and D2 computed in this way and the thing into which the include angle theta is registered as a thing of each bill with reference to a database. Although this database structure is shown in drawing 26 , one spacing D1 and D2 and include angle theta are only registered about each bill. Since it precedes for every each set elephant block and whenever [coincidence] is seen, in this database, it is because just the information only on those positional information, i.e., arrangement structure, is enough. Of course, it can be said that this database constitutes the second storage means.

[0064] In addition, two databases shown in drawing 24 or drawing 26 judge coincidence of a

pattern fundamentally, and have divided it into the activity which obtains coincidence of only the pattern of a small field, and the activity checked from the coincidence result using relative positional information like this operation gestalt as concrete technique. Of course, the effectiveness of raising recognition effectiveness is expectable, reducing the amount of data processing by doing in this way. For example, as shown in drawing 25 , when grouping is carried out to Bill ID by Rotation ID, what cannot generate the combination of three blocks itself is produced. Although this is not in agreement as a pattern by having taken in the technique of the central value further mentioned above about the small field, it is the case where only central value approximates by chance. And only now, although incorrect recognition arises, incorrect recognition is mostly lost by applying narrowing down for the relative-position information on other blocks.

[0065] When there is a match with reference to a database at step 275, a bill recognition flag will be set at step 285, this bill recognition routine will be ended, but when there is no match, it returns to step 265 and another combination is examined. And when combination is found by other bills ID and other rotations ID, an interblock gap and an include angle are computed about them, and a database is referred to. It means ending the bill recognition routine of step 140 in the main routine which shows drawing 6 whether the next candidate is lost when there are congruous things. Then, at step 150, it judges based on the bill recognition flag which mentioned above whether there was any bill. When a bill has not been recognized, the image data of high resolution is reread from a hard disk 36 at step 160, and color conversion is carried out from the color specification space of RGB to the color specification space of a color printer 20. Then, half toning is carried out at step 170. That is, it does not pass over the expression gradation in this color printer 20 to 2 gradation of whether to attach color ink, but the gray scale conversion to 2 gradation becomes this half toning from 256 gradation. In addition, it does not dare explain such color conversion or half toning that what is necessary is just to apply the usual technique. And CPU31 is outputted to a color printer 40 through I/O37 by using the image data of CMYK2 generated gradation as print data.

[0066] Print data are inputted into a printer controller 45, and this printer controller 45 makes it print by making a predetermined color ink grain breathe out in a color printer 40, outputting the contents of a buffer to the print head controller 42, and shifting a print head 41 by the print head shift motor 43, when it writes in in the form of predetermined to the print head buffer which is not illustrated and the data corresponding to the scan of the batch of a print head 41 were stored. Moreover, if the scan of a batch finishes, paper feed will be carried out by the paper feed motor 44. And the image data which repeated these and was read with the color scanner 20 will be sent to a color printer 40 through predetermined data conversion, and facsimile posting will be carried out by need number of copies.

[0067] On the other hand, when it is judged that there was a bill, 160 or less-step processing is not performed. Therefore, in spite of containing the bill, it does not color-print. In this operation gestalt, although it is made not to perform all color printings, the solution is various. For example, since three blocks show the location of a bill, processing in which make only the part void, and print, change and print a color purposely, or alphabetic characters, such as "WARNING", are printed in piles may be performed.

[0068] By the way, in the operation gestalt mentioned above, although software has realized almost all processings, hardware-izing is also possible. The block diagram shows the characteristic quantity derivation processing circuit for rough recognition to drawing 27 as the example. In this example, if the signal showing the gradation value of RGB each color is inputted into the brightness data-conversion section 61, it will change into the brightness as the average and will output to the histogram IKORAIZESHON section 62 and the two color difference calculation sections 65 and 66. The histogram IKORAIZESHON section 62 realizes in hardware the normalization based on a pareto which was mentioned above, and the contents of the translation table 63 are updated based on the result. On the other hand, although the two color difference calculation sections 65 and 66 compute the color difference in hardware, since it is the thing before input data normalizes, the color difference in the condition of having normalized with reference to the contents of the translation table 63 is computed. And the brightness

standard-deviation calculation section 64 computes the standard deviation of brightness based on the contents of the translation table 63, the median calculation section 68 computes a median and the color difference standard-deviation calculation section 67 computes the standard deviation about the color difference. In addition, about each standard deviation, it divides and outputs to two lines of x directions and the direction of y.

[0069] Moreover, drawing 28 shows the block diagram at the time of hardware-izing the whole color reproducing unit. The control panel 71 is equipped with the copy carbon button etc., and generates the control signal which corresponds based on copy actuation. A control signal is outputted to the line sensor mechanical component 72 and a line sensor 73, if it is copy actuation, this line sensor mechanical component 72 will carry out slide migration of the line sensor, and this line sensor 73 will output image data to predetermined timing. Color correction of this image data is carried out in the data correction section 74, and it is written in the image buffer 75. Color correction amends the difference for every model, the output change of a line sensor 73 based on the secular change of a lighting lamp which are not illustrated, etc., and they carry out color correction by the matrix operation.

[0070] The image buffer 75 has memorized image data in the state of high resolution, and the rough image data acquisition section 76 extracts characteristic quantity, such as the color difference, a variance of brightness, and a median, performing low resolution-ization which was mentioned above. Of course, this characteristic quantity expresses the distribution situation about a chromaticity, the characteristic quantity based on the image of a bill is beforehand put in a database by the rough image database 77, and the rough image data matching section 78 searches the rough image database 77 based on the computed characteristic quantity.

[0071] When it can say that the result of this retrieval is inputted into the detail image data matching section 82, and was matched in the state of rough image data, the detail image data matching section 82 concerned acquires the image data about the pattern which the detail image data acquisition section 79 low-resolution-ized, and generated, and searches the detail image database 81 which memorized the image data about the pattern based on the image of a bill. In addition, also in this example, as mentioned above, the positional information first matched in a small field is memorized, and finally the existence of a bill is judged from relative-position information.

[0072] The rough image data matching section 78 will be told to the detail image data matching section 82 and the copy prohibition judging section 83 if retrieval is ended over all the fields of image data, and it judges the existence of a bill that the detail image data matching section 82 mentioned above from relative-position information. When the bill is not contained, the copy control section 84 reads the image data of high resolution from the above-mentioned image buffer 75, and it is made it to carry out color facsimile posting to the color printing section 85, although this copy prohibition judging section 83 tells that to the copy control section 84 and a copy is forbidden, when that decision result is outputted to this copy prohibition judging section 83 and a bill is contained.

[0073] in addition -- although only the bill is explained in the operation gestalt mentioned above as an example to which a color copy is forbidden -- a stock certificate -- it is -- they are specific private document and official document -- etc. -- especially the object is not limited. Moreover, you may use in semantics which does not detect that a copy is forbidden but detects the class of bill. Furthermore, even when some bills have piled up with other images or bills are in stripes in piles by making it match with the block of two or more locations formed into the small field as mentioned above, it may be able to discover.

[0074] thus, a rough recognition of the characteristic quantity which mainly expresses the distribution situation about a chromaticity before performing the image recognition which paid its attention to the pattern sake -- computing (step 210) -- Only when it is judged that it is similar (step 220), in order to have computed the similarity as rough recognition as compared with the database based on this characteristic quantity (step 215), and to perform detail recognition about a pattern, In order to eliminate the bill which can be mixed by the low probability, the need of always performing detail recognition is lost and the processing time etc. can be accelerated.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
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TECHNICAL FIELD

[Field of the Invention] This invention relates to image rough recognition equipment, the image rough recognition approach, the medium that recorded the image rough recognition program, image recognition equipment, and a color reproducing unit.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] It is becoming a technical problem how images which should be copied and which do not come out, such as a bill, should be forbidden along with the precision of a color reproducing unit improving. Judging whether the image of a bill is contained in the color picture which read digital processing by the intervening color reproducing unit aside from the thing using analog technology is proposed. In this case, the image data of a bill is memorized and pattern matching of the read color picture data and the image data of a bill is carried out.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] Image rough recognition equipment with possible this invention ceasing to compare the pattern which requires rating great when [almost all] such specimen is not contained by judging whether the image of the specimen is contained as rough recognition from the distribution situation in a small field mainly concerning a chromaticity, and raising the effectiveness as the whole, as explained above can be offered.
[0030] Moreover, since the distribution situation was searched for on the basis of the train classified in the direction in every direction according to invention concerning claim 2, it is easy to express a distribution situation and rating can also be lessened. Furthermore, according to invention concerning claim 3, since a variance is used, it is easy to express a distribution situation. Furthermore, according to invention concerning claim 4, it is hard coming to win popularity the effect of dirt etc. by normalizing brightness. Furthermore, according to invention concerning claim 5, the color difference used for a judgment can compute comparatively easily, and rating decreases.
[0031] Furthermore, according to invention concerning claim 6, since the general brightness itself is used, it is not necessary to newly calculate, and becomes in many cases, and rating decreases. Furthermore, according to invention concerning claim 7, it can judge synthetically from two or more distribution situations, and recognition effectiveness can be raised. Furthermore, according to invention concerning claim 8, in order to use the distribution situation in a small field, the amount of data becomes and the retrieval also becomes [setting up and putting two or more angle of rotation in a database beforehand] realistic easy.
[0032] Furthermore, according to invention concerning claim 9, correspondence in rotation of an omnidirection is attained, lessening capacity of a database. Furthermore, since it judges whether the range is set up and it enters between them by the upper limit and the lower limit according to invention concerning claim 10, the rating which decision takes decreases. Furthermore, according to invention concerning claim 11, the image rough recognition approach which does the same effectiveness so can be offered, and the medium which recorded the image rough recognition program can be offered according to invention concerning claim 12.
[0033] Furthermore, according to invention concerning claim 13, the image recognition equipment which can perform overall image recognition efficiently using such rough recognition can be offered, and the color reproducing unit which can eliminate efficiently what the copy is forbidden can be offered according to invention concerning claim 14.
[0034]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. Drawing 1 shows the color reproducing unit which applied the image rough recognition equipment concerning 1 operation gestalt of this invention by the appearance perspective view.
[0035] This color reproducing unit 10 consists of a color scanner 20, a copy server 30, and a color printer 40, if a color picture is read with a color scanner 20 based on control by the copy server 30, the copy server 30 concerned will carry out the image processing of the read image data, it will generate print data, and a color printer 40 will color-print it based on these print data. Drawing 2 shows the outline configuration of a color scanner 20, and has adopted the

flatbed type. the lower part of the transparence plate 21 which lays a copied subject -- the lighting lamp 22 and a line sensor 23 -- a both-way slide -- while being supported movable, driving-belt 24a, pulley 24b, and drive-motor 24c for driving these are arranged, and it connects with the control circuit 25. Since a copied subject will be illuminated through the transparence plate 21 if the lighting lamp 22 lights up based on the control signal from a control circuit 25 when reading a color picture, the reflected light from this copied subject is irradiated by the line sensor 23 through this transparence plate 21. The filter and CCD component corresponding to three primary colors of light read a single tier and the color arrangement for the single tier covering [triplex-row arrangement is usually carried out and] the cross direction of a copied subject by the CCD component of this triplex row into a line sensor 23 per Isshiki, and output to it as image data. On the other hand, by making drive-motor 24c drive, a control circuit 25 acquires and outputs image data from a line sensor 23, whenever it moves these lighting lamps 22 and line sensors 24 toward the die-length direction of a copied subject in one and you make it move by very small distance. Vertical scanning will be carried out in the die-length direction, carrying out horizontal scanning of the copied subject crosswise externally by this, and 2-dimensional image data will be generated.

[0036] Drawing 3 shows the copy server 30 with the outline block diagram. This copy server 30 is roughly equivalent to a computer, and RAM33, ROM34, a control panel 35, a hard disk 36, and I/O37 are connected to the bus 32 of CPU31. Although explanation is not required especially about these, the color scanner 20 and the color printer 40 are connected through I/O37. Moreover, a fundamental operation program and a fundamental translation table are written in ROM34, and CPU31 performs this basic program, using RAM33 as a work area, and refer to the translation table for it if needed. Moreover, a hard disk 36 is used, when using it as a buffer in which the mainly read image data is stored or saving the program updated serially. In addition, in order to have the image recognition substrate 38 which performs image recognition processing later mentioned as a two-dot chain line shows and to raise the whole performance in this case, direct access is carried out to the hard disk 36 which memorizes image data, and it may be made to advance processing. In addition, with various kinds of manual operation buttons which are copy initiation carbon button 35a, or input copy number of sheets into a control panel 35, such as ten key 35b, it has liquid crystal display 35c for checking actuation information etc., and CPU31 can supervise the actuation situation of the control panel 35 concerned through a bus 32.

[0037] Drawing 4 shows the configuration of a color printer 40 roughly, and has adopted the ink jet method which prints by breathing out color ink in the shape of a dot matrix to a record in the paper. Printer controllers 45 which are in charge of an interface with the external instrument in the print head 41 which consists of three print head unit 41a, the print head controller 42 which controls this print head 41, the print head shift motor 43 made to move the print head 41 concerned in the direction of a digit, the paper feed motor 44 which sends a print form to a line writing direction, these print head controllers 42 and the print head shift motor 43, and the paper feed motor 44 are consisted of more by the detail.

[0038] This color printer 40 uses the color ink of four colors as printing ink, and the printing nozzle of two trains which became independent, respectively is formed in each print head unit 41a. Can change the color ink to supply per train of a printing nozzle, and both trains supply black ink (K) about print head unit 41a of an illustration left in this case. While supplying Magenta color ink (M) to a left column about print head unit 41a of the method of the illustration right, yellow color ink (Y) is supplied to a right column. While supplying cyanogen color ink (C) to a left column about print head unit 41a of illustration middle, the right column supposes un-using it. In addition, in this operation gestalt, although the color ink of four colors is used, it is also possible to use the color ink of six colors for the maximum using the printing nozzle of two trains in three print head unit 41a. In this case, about cyanogen and a Magenta, it can consider as a total of six colors further using yellow and black using dark color ink and light color ink.

[0039] In this operation gestalt, although applied as a color reproducing unit 10 of the dedication which uses such a copy server 30 as a nucleus, even if it adopts a color copy system with the color scanner 51 as shown in drawing 5 , and the personal computer 53 equipped with the color

printer 52, it is realizable similarly. Moreover, though it is applicable to forgery of the bill at the time of having output units, such as a color printer Acquire color picture data fundamentally, can realize at least personal computer 53 as image recognition equipment for the purpose of performing existence of a bill for a short time correctly, and In that case, it cannot be overemphasized that it is also realizable as image rough recognition equipment which judges whether it sets, a bill makes [image] it image data for the time being, and the kimono is contained.

[0040] Therefore, it is useful to also make it intervene as image rough recognition equipment or image recognition equipment in the communication path by which image data is transmitted and received as Field of application. Moreover, also when judging whether it is a bill truly in reverse semantics, it is available, and in an automatic vending machine or a money-changing machine, it can also apply as tag recognition equipment. Drawing 6 shows the outline of the color copy processing which the copy server 30 performs with the flow chart, and explains image rough recognition on the basis of this color copy processing hereafter. If this processing is explained roughly, it will print only within the case where stand by initiation actuation of a copy at step 110, judge whether the image which should forbid a copy at steps 120-140 is contained, and the predetermined image is not contained at steps 150-180.

[0041] First, decision whether the image which should forbid a copy is contained is explained. If it is judged that copy initiation actuation was carried out at step 110, processing which reads image data will be performed at step 120. CPU31 specifically supervises the actuation situation of a control panel 35, and if it detects that copy initiation carbon button 35a was depressed, an image reading command is sent out to a color scanner 20 through I/O37. Then, the control circuit 25 of a color scanner 20 makes the lighting lamp 22 turn on, takes out a drive command with drive-motor 24c, and carries out slide migration of this lighting lamp 22 and the line sensor 23. And whenever only predetermined distance moves, a control circuit 25 transmits the image data about the image which the line sensor 23 read to reception and the copy server 30. In the copy server 30 side, this image data is received through I/O37, and it once memorizes to a hard disk 36.

[0042] If image data is read, at step 130, the image data of the low resolution for bill recognition will be generated. the reading resolution of this color scanner 20 is 600dpi (dots per inch), and make it rough recognition -- since the amount of data treated with the condition of the resolution beside detail recognition fake increases too much and it becomes impossible to identify by slight gap, it low-resolution-izes to 50dpi. It also takes into consideration also reading with high resolution anew, after it read with the low resolution when reading in a low resolution was possible, and performing bill recognition in a color scanner 20, and replacing a manuscript with, while reading over 2 times, although it is not impossible, andis [low-resolution-] made toize within the copy server 30 about the image data read with high resolution. In low-resolution-izing from 600dpi to 50dpi, 1 pixel may be operated on a curtailed schedule and extracted for 12 pixels of every direction, and the operation to equalize may be performed. In addition, naturally such low resolution-ization is not necessarily what is restricted to 50dpi, and it is also possible to high-resolution-ize like 60dpi by a hardware configuration etc.

[0043] Drawing 7 shows the situation of this low-resolution-izing, and in the following processings, while making a 40x40-pixel small field into a batch in the condition of having been referred to as 50dpi, in order to make it move every 5 pixels about this small field, it low-resolution-izes [direction / die-length] about 5 pixels as 40 pixels and a migration field while it low-resolution-izes to 50dpi at once about the cross direction. Of course, it takes for advancing processing and every 5 pixels are low-resolution-ized about the die-length direction. In addition, about the cross direction, it is 585 pixels by 50dpi, and about 292.5mm image is expressed with 11.7 inches. In addition, all are previously low-resolution-ized covering the die-length direction, and you may make it store into a hard disk 36. Of course, as for this movement magnitude, it is possible like 4 pixels, 3 pixels, and 2 pixels to make it fluctuate suitably. Of course, if it lessens, while a recognition rate will improve, it has a relation that throughput increases and the recognition time starts. Moreover, also about the size of a small field, it is not limited to 40x40 pixels, and can fluctuate.

[0044] Although the bill recognition routine shown in a detail at drawing 8 and drawing 9 based on the low-resolution-ized image data is performed at step 140, the technique of the image recognition carried out with this operation gestalt with reference to drawing 10 and drawing 11 is explained briefly first. It judged whether if the conventional image recognition is a bill, it incorporates the image data of the whole bill beforehand, and it would be made it to carry out pattern matching to the image data read from the color scanner 20 etc., and it would contain the image of a bill. However, since the amount of data processing of pattern matching [such] increased when processing not being in agreement if it leans slightly, and making it rotate in connection with it etc., it was unreal.
[0045] On the other hand, as shown in drawing 10 , three characteristic image parts of the bills are chosen, and coincidence is detected according to an individual, respectively. Supposing it calls each block BLK1 - block BLK3, the detection result memorizes the location for every block, will be between the blocks detected at the end, and will investigate the relative-position relation in the case of the original bill. Drawing 11 R> 1 presupposes that the segments which show the contents of processing, block BLK1 and block BLK3 separate distance D2, and are located while separating distance D1 from block BLK1 and block BLK2 with the original bill and being located, and connect each serve as an include angle theta. Therefore, it asks for each relative-position relation according to an individual from the information which memorized the location for every block, and if the physical relationship in the case of a bill is found out, it will be judged as that in which the image of a bill is contained. In addition, if the number of such characteristic image parts is not necessarily restricted to three places and increases like four places and five places, a recognition rate will improve.
[0046] Although it is also possible to use a 40x40-pixel pattern as it is about such a small field, as shown in drawing 12 and drawing 13 , in this operation gestalt, data processing is performed from another viewpoint. First, being shown in this drawing summarizes that it is [2-pixel] at a time 40 pixels of every direction, it divides it into 20 trains, and totals each train in a lengthwise direction and a longitudinal direction further. If the central value of 20 pieces which became independent in the longitudinal direction when it totaled to the lengthwise direction calculates and it totals in a longitudinal direction, the central value of 20 pieces which became independent to the lengthwise direction will calculate. Hereafter, such central value is referred to as x(0) -x (19), y (0) - y (19).
[0047] Thus, the technique of choosing central value becomes very effective to rotation of a pattern. Drawing 14 and drawing 15 are drawings showing the effectiveness over this rotation processing. Though restricted to a characteristic image part, a bill is unchanging for it having to have the image data which rotated to the omnidirection by whether it is arranged at which sense. However, what is necessary is coming to have only pattern data rotated within 1 quadrant after separating into four quadrants, as the omnidirection of 360 degrees is shown in drawing 15 , if the above central value's will be used. The inside of 1 quadrant is equally divided to drawing 14 six, and it is made to rotate it. Supposing it calls these pattern data P (0) - P (5), even if the upper and lower sides become reverse about each direction of a train by taking central value, pattern data P (0) - P (5) are eternal. Therefore, although angle of rotation takes for progressing and changes with pattern data P (0) - P (5) within the 1st quadrant Within the 2nd quadrant, angle of rotation takes for progressing and it changes with pattern data P (5) - P (0), and hereafter, within the 3rd quadrant, it changes with pattern data P (0) - P (5), and only changes with pattern data P (5) - P (0) within the 4th quadrant. Therefore, it can judge whether it is in agreement only by comparing with pattern data [only in 1 quadrant] P (0) - P (5).
[0048] On the other hand, although the amount of operations falls, if forming a small field to 40x40 pixels also moves every 1 pixel of small fields and it is comparing pattern data, the amount of data processing increases still more. For this reason, it is processed also into the pattern data beforehand prepared corresponding to this, although every 5 pixels of small fields will be moved and it will go. Drawing 16 shows this processing, and it equalizes the pattern data at the time of the ability to shift a small field in the direction (x directions, the direction of y) in every direction beforehand so that it is in the successive range for 5 pixels, and may be easy to be in agreement as possible and may become. If it does in this way, it becomes easy to obtain the decision result

in agreement in general that the small field in the read image data is completely in agreement with pattern data within the limits of the gap for 5 pixels of what is lost. In addition, in this example, the gap for 5 pixels can be covered in the range in which it moved every 2 pixels vertically and horizontally from the core, respectively.

[0049] Thus, the processing which computes the central value of every 20 every direction about a 40x40-pixel small field is detail recognition characteristic quantity calculation processing of step 225 shown in drawing 8 , and the processing which judges whether it is in agreement as compared with the central value of every 20 every direction [in / for this / pattern data] is detail recognition similarity calculation processing of step 230. In this detail recognition similarity processing, since a total of 40 independent gaps of central value called every 20 every direction must be judged objective, Similarity f is computed like a degree type.

[Equation 1]

$$f = \sum_{i=0,19} [\{Px(i) - x(i)\}^{**2} + \{Py(i) - y(i)\}^{**2}]$$

In addition, Px (i) and Py (i) are the central value about pattern data.

[0050] However, since much square operations are repeated, this operation takes time amount in fact. Especially, like the check of the bill in an automatic vending machine, if the bill is contained in almost all cases, tolerance will also become large, but in the case of the color reproducing unit 10, effectiveness, such as paperwork in an operator, will be then worsened so that the operation time may be taken, although the bill etc. is not contained in a large majority of cases. In here, the semantics which is made to perform rough recognition like this operation gestalt arises. That is, since low precision is sufficient, it judges whether the image of a bill may be contained in the image data read at step 210 and step 215 for a short time, and a similarity operation with a high precision mentioned above as that where no bill is in almost all cases will be omitted. Drawing 17 shows the processing which computes the characteristic quantity for performing rough recognition with the flow chart.

[0051] Before explaining rough recognition, histogram IKORAIZESHON of step 205 is explained. This histogram IKORAIZESHON amends the brightness of the read image data. For example, the bill which is circulating has high possibility of being stained with soot if it compares from the time of a new note when it reads with dirt and a color scanner 20, and having become a dark image. Moreover, it may also be considered the width of face of contrast is narrow rather than only dark, and the bias may have arisen also with the property of a color scanner 20 further. Drawing 18 totals the brightness of each pixel when generating a 40x40-pixel small field, and expresses it to a pareto. It supposes that it became distribution as shown in this drawing (a) about a bill without dirt, and suppose that the paretos about the bill which is circulating were this drawing (b) and this drawing (c). By what can grasp that the configuration of distribution is alike although the width of face of contrast is narrow on the whole, and shows it in this drawing (c), although it is dark on the whole, it can grasp that the configuration of distribution is alike what is shown in this drawing (b). That is, although brightness is influenced with dirt etc., the description of distribution itself is not influenced so much. Therefore, what a brilliance control is carried out for so that the minimum brightness ymin of distribution and the highest brightness ymax may be detected and the width of face may spread equally in the range of the minimum brightness "0" - highest brightness "255" is the outline of histogram IKORAIZESHON.

[0052] Drawing 19 and drawing 20 show the situation of this conversion, determine Parameters a and b by transformation called y'=ay+b, and should just create the translation table to normalization brightness y' in the range which brightness y can take beforehand. In addition, although brightness y cannot be directly obtained since image data is inputted with the gradation value of RGB in this operation gestalt, it replaces and uses by y= (R+G+B) / 3 roughly. Moreover, processing is advanced to below on the basis of the brightness normalized in this way.

[0053] Although it returns to the rough recognition characteristic quantity calculation processing shown in drawing 17 , in this rough recognition, the median of brightness and two kinds of color difference are used. First, at step 310, the median ymed of brightness is determined for 1600

pixels. A median is brightness in which 800 pixels is contained in a pareto. next -- as the central value mentioned above while searching for the color difference 1 (I-R) which is the difference of brightness (I) and a red component (R) in 1600 pixels at step 320 -- every train -- equalizing -- further x(0) - the variance IRXdev in x (19) and the variance IRYdev in y (0) - y (19) are computed. moreover -- as the central value mentioned above while searching for the color difference 1 (I-G) which is the difference of brightness (I) and a green component (G) for every pixel similarly at step 330 -- every train -- equalizing -- further x(0) - the variance IGXdev in x (19) and the variance IGYdev in y (0) - y (19) are computed. And at step 340, same processing is performed about brightness and Variances IXdev and IYdev are computed.

[0054] When it does in this way, in rough recognition, seven characteristic quantity will be obtained about a 40x40-pixel field with six variances IRXdev, IRYdev, and IGXdev, IGYdev, IXdev, IYdev, and a median ymed. The characteristic quantity about the color difference has the large semantics reflecting the change degree of the color tone of a bill. For example, since it is a difference with brightness if it is the color difference, it is hard to be influenced of dirt. In the semantics which loses the effect of brightness, if lightness-index L* and chromaticness-index u*v* use the system of coordinates separated completely like a L*u*v* color coordinate system as shown in drawing 21 , a color tone can be judged without being mostly influenced of the dirt of a bill etc. Moreover, as shown in drawing 22 , the system of coordinates which made effect of brightness hard to be influenced by simple conversion may be used.

[0055] In this operation gestalt, although the color difference is used, even if the variance will be used and a color tone is different, it can become the same variance. However, since the variance itself expresses variation, the change degree of a pattern can be reflected. Moreover, the variance of the brightness itself is also used. As mentioned above, although a color tone is different, a variance can become the same, but it is from idea **** that it is in agreement to brightness even in this case, when few.

[0056] That is, when judging a color tone and a pattern, it can be called what it is comparatively easy to use, but neither of above characteristic quantity will also not necessarily be the last element which would be limited to these, if it says conversely. For example, in the semantics of a color tone, finding the bill which will seemingly be green in a reddish image is lost by using both the average and a variance. In addition, when the activity which computes characteristic quantity by doing in this way constitutes a retrieval information acquisition means (the first), obtain and it is.

[0057] Similarity is checked referring to the database obtained from an original bill at step 215 using the characteristic quantity computed by having carried out in this way on the other hand. Drawing 23 shows this database structure. In this operation gestalt, two or more bills are made detectable and ID is attached for every bill. Moreover, three places are set up as a block for recognition for every bill, and the lower limit is prepared for the upper limit of six variances IRXdev, IRYdev, and IGXdev which mentioned each block above further about the pattern data which rotated in the six directions, IGYdev, IXdev, IYdev, and a median ymed.

[0058] Unlike the case of the check of a pattern which was mentioned above, with the check of this similarity, it judges whether each characteristic quantity is only contained between a upper limit and a lower limit. Thereby, it stops requiring a square operation etc. and the amount of operations decreases. Moreover, if it is made to restrict when all characteristic quantity goes into within the limits, it can judge extremely whether it is the high thing of similarity by sorting the upper limit and the lower limit for every item in a short time. namely, a upper limit [as opposed to the variance IRXdev of the color difference 1 as the 1st sort key] -- as the second sort key -- this lower limit -- as -- if it sorts by carrying out, what is necessary is to investigate whether it is contained in the range in order about six variances, and just to close, if at least one becomes out of range, and the comparison itself is very easy. In addition, it can be said that this database constitutes a storage means (the first).

[0059] Detail recognition is performed at step 225,230 which judged the check result of this similarity at step 220, and was mentioned above only when similar. Therefore, it can be said that decision of this step 220 constitutes the judgment means (the first). Drawing 24 shows the database structure which memorizes the central value for detail recognition. The central value

used by detail recognition is the average of the brightness for every train. If central value x(0) -x (19), y (0) - y (19) are computed using the normalized brightness, coincidence of a pattern can be judged as a monochrome pattern. In addition, it can be said that acquisition of the central value in this semantics constitutes the second retrieval information acquisition means. Of course, although the example that black and white are inadequate is probably also in a term ** sake about completeness, when it does not know where an image is, it is not necessary to investigate to there. If it is only term ** about completeness, it is because what is necessary is just to re-consider a color picture when next decision is added and the location of a bill can judge certainly.

[0060] At step 230, since Similarity f is called for, it judges whether it can be said that it is similar at step 235 as compared with a threshold. And in being similar, it memorizes to another field as data which are similar at step 240. It is Bill ID, Block ID, and Rotation ID which must be memorized here as shown by drawing 24 . The block of where of which bill memorizes [which] whether it was detected in the state of rotation. Of course, it can be said that decision of this comparison constitutes the second judgment means.

[0061] Also when similar and there is nothing, it moves by 5 pixels at step 245 in a 40x40-pixel small field. This object block slack smallness field is hereafter moved in the cross direction and the die-length direction about the image data read from the color scanner 20, and it repeats until it is judged that it was all ended at step 250. When it ends about all blocks, information as shown in drawing 25 is memorized as similar data. Although this drawing shows Bill ID, Block ID, and Rotation ID, showing clearly that the location of a small field is intelligible, the positional information of an object block is only attached with each ID in fact.

[0062] At step 255 shown in drawing 9 , the bill recognition flag is cleared first. This bill recognition flag will show that the image of a bill was contained, if it is ON with reference to the last, and so to speak, it will initialize it at this time. At the following step 260, it sorts by each ID about a similar object block. That is, it is because those from which angle of rotation differs do not have semantics even if it is unrelated even if there are similar data of a different bill, and it is the same bill. At step 265, while being the same bill, the combination candidate of three blocks is created for the thing used as the same angle of rotation. If the combination of three blocks is found, since it can become the candidate of at least one bill, spacing and the include angle of a block are computed at step 270. If it says in the example shown in drawing 25 , those with three and those blocks ID serve as combination of that in which Rotation ID is set to "1" and Bill's ID is common about the thing of "1" three blocks like "1" - "3." Therefore, while computing the spacing D1 during the block whose blocks ID are "1" and "2", and the spacing D2 during the block whose blocks ID are "1" and "3", an include angle theta is computed.

[0063] At step 275, it judges whether they are the spacing D1 and D2 computed in this way and the thing into which the include angle theta is registered as a thing of each bill with reference to a database. Although this database structure is shown in drawing 26 , one spacing D1 and D2 and include angle theta are only registered about each bill. Since it precedes for every each set elephant block and whenever [coincidence] is seen, in this database, it is because just the information only on those positional information, i.e., arrangement structure, is enough. Of course, it can be said that this database constitutes the second storage means.

[0064] In addition, two databases shown in drawing 24 or drawing 26 judge coincidence of a pattern fundamentally, and have divided it into the activity which obtains coincidence of only the pattern of a small field, and the activity checked from the coincidence result using relative positional information like this operation gestalt as concrete technique. Of course, the effectiveness of raising recognition effectiveness is expectable, reducing the amount of data processing by doing in this way. For example, as shown in drawing 25 , when grouping is carried out to Bill ID by Rotation ID, what cannot generate the combination of three blocks itself is produced. Although this is not in agreement as a pattern by having taken in the technique of the central value further mentioned above about the small field, it is the case where only central value approximates by chance. And only now, although incorrect recognition arises, incorrect recognition is mostly lost by applying narrowing down for the relative-position information on other blocks.

[0065] When there is a match with reference to a database at step 275, a bill recognition flag will be set at step 285, this bill recognition routine will be ended, but when there is no match, it returns to step 265 and another combination is examined. And when combination is found by other bills ID and other rotations ID, an interblock gap and an include angle are computed about them, and a database is referred to. It means ending the bill recognition routine of step 140 in the main routine which shows drawing 6 whether the next candidate is lost when there are congruous things. Then, at step 150, it judges based on the bill recognition flag which mentioned above whether there was any bill. When a bill has not been recognized, the image data of high resolution is reread from a hard disk 36 at step 160, and color conversion is carried out from the color specification space of RGB to the color specification space of a color printer 20. Then, half toning is carried out at step 170. That is, it does not pass over the expression gradation in this color printer 20 to 2 gradation of whether to attach color ink, but the gray scale conversion to 2 gradation becomes this half toning from 256 gradation. In addition, it does not dare explain such color conversion or half toning that what is necessary is just to apply the usual technique. And CPU31 is outputted to a color printer 40 through I/O37 by using the image data of CMYK2 generated gradation as print data.

[0066] Print data are inputted into a printer controller 45, and this printer controller 45 makes it print by making a predetermined color ink grain breathe out in a color printer 40, outputting the contents of a buffer to the print head controller 42, and shifting a print head 41 by the print head shift motor 43, when it writes in in the form of predetermined to the print head buffer which is not illustrated and the data corresponding to the scan of the batch of a print head 41 were stored. Moreover, if the scan of a batch finishes, paper feed will be carried out by the paper feed motor 44. And the image data which repeated these and was read with the color scanner 20 will be sent to a color printer 40 through predetermined data conversion, and facsimile posting will be carried out by need number of copies.

[0067] On the other hand, when it is judged that there was a bill, 160 or less-step processing is not performed. Therefore, in spite of containing the bill, it does not color-print. In this operation gestalt, although it is made not to perform all color printings, the solution is various. For example, since three blocks show the location of a bill, processing in which make only the part void, and print, change and print a color purposely, or alphabetic characters, such as "WARNING", are printed in piles may be performed.

[0068] By the way, in the operation gestalt mentioned above, although software has realized almost all processings, hardware-izing is also possible. The block diagram shows the characteristic quantity derivation processing circuit for rough recognition to drawing 27 as the example. In this example, if the signal showing the gradation value of RGB each color is inputted into the brightness data-conversion section 61, it will change into the brightness as the average and will output to the histogram IKORAIZESHON section 62 and the two color difference calculation sections 65 and 66. The histogram IKORAIZESHON section 62 realizes in hardware the normalization based on a pareto which was mentioned above, and the contents of the translation table 63 are updated based on the result. On the other hand, although the two color difference calculation sections 65 and 66 compute the color difference in hardware, since it is the thing before input data normalizes, the color difference in the condition of having normalized with reference to the contents of the translation table 63 is computed. And the brightness standard-deviation calculation section 64 computes the standard deviation of brightness based on the contents of the translation table 63, the median calculation section 68 computes a median and the color difference standard-deviation calculation section 67 computes the standard deviation about the color difference. In addition, about each standard deviation, it divides and outputs to two lines of x directions and the direction of y.

[0069] Moreover, drawing 28 shows the block diagram at the time of hardware-izing the whole color reproducing unit. The control panel 71 is equipped with the copy carbon button etc., and generates the control signal which corresponds based on copy actuation. A control signal is outputted to the line sensor mechanical component 72 and a line sensor 73, if it is copy actuation, this line sensor mechanical component 72 will carry out slide migration of the line sensor, and this line sensor 73 will output image data to predetermined timing. Color correction

of this image data is carried out in the data correction section 74, and it is written in the image buffer 75. Color correction amends the difference for every model, the output change of a line sensor 73 based on the secular change of a lighting lamp which are not illustrated, etc., and they carry out color correction by the matrix operation.

[0070] The image buffer 75 has memorized image data in the state of high resolution, and the rough image data acquisition section 76 extracts characteristic quantity, such as the color difference, a variance of brightness, and a median, performing low resolution-ization which was mentioned above. Of course, this characteristic quantity expresses the distribution situation about a chromaticity, the characteristic quantity based on the image of a bill is beforehand put in a database by the rough image database 77, and the rough image data matching section 78 searches the rough image database 77 based on the computed characteristic quantity.

[0071] When it can say that the result of this retrieval is inputted into the detail image data matching section 82, and was matched in the state of rough image data, the detail image data matching section 82 concerned acquires the image data about the pattern which the detail image data acquisition section 79 low-resolution-ized, and generated, and searches the detail image database 81 which memorized the image data about the pattern based on the image of a bill. In addition, also in this example, as mentioned above, the positional information first matched in a small field is memorized, and finally the existence of a bill is judged from relative-position information.

[0072] The rough image data matching section 78 will be told to the detail image data matching section 82 and the copy prohibition judging section 83 if retrieval is ended over all the fields of image data, and it judges the existence of a bill that the detail image data matching section 82 mentioned above from relative-position information. When the bill is not contained, the copy control section 84 reads the image data of high resolution from the above-mentioned image buffer 75, and it is made it to carry out color facsimile posting to the color printing section 85, although this copy prohibition judging section 83 tells that to the copy control section 84 and a copy is forbidden, when that decision result is outputted to this copy prohibition judging section 83 and a bill is contained.

[0073] in addition -- although only the bill is explained in the operation gestalt mentioned above as an example to which a color copy is forbidden -- a stock certificate -- it is -- they are specific private document and official document -- etc. -- especially the object is not limited. Moreover, you may use in semantics which does not detect that a copy is forbidden but detects the class of bill. Furthermore, even when some bills have piled up with other images or bills are in stripes in piles by making it match with the block of two or more locations formed into the small field as mentioned above, it may be able to discover.

[0074] thus, a rough recognition of the characteristic quantity which mainly expresses the distribution situation about a chromaticity before performing the image recognition which paid its attention to the pattern sake -- computing (step 210) -- Only when it is judged that it is similar (step 220), in order to have computed the similarity as rough recognition as compared with the database based on this characteristic quantity (step 215), and to perform detail recognition about a pattern, In order to eliminate the bill which can be mixed by the low probability, the need of always performing detail recognition is lost and the processing time etc. can be accelerated.

[Translation done.]

* NOTICES *

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Although it is not technically impossible to carry out pattern matching of the read color picture data and the image data of a bill as proposed conventionally, it is difficult to practice. For example, the image consistency of extent which is equal to a copy is very high, and pattern matching of the image data of a bill is planned on this level because it becomes the immense amount of data. Moreover, dirt and a wrinkling also become a problem in many cases, and if it is going to carry out pattern matching to what is arranged aslant, the amount of operations will increase further.
[0004] Therefore, the technique of extent proposed from the former was unrealizable in fact. On the other hand, these people low-resolution-ized also about the read color picture data, and developed the technique of judging whether an image corresponding for every small field while they put three small fields in a bill in a database with the low resolution in view of such a situation. Although explained in full detail in the operation gestalt later mentioned about this technique, since it was what judges whether a pattern is in agreement about every small field even in this case, reduction-ization of the amount of operations was left behind as further purpose.
[0005] This invention was made in view of the above-mentioned technical problem, and in making it make it not copy a bill etc., it aims at offer of the image rough recognition equipment which can be enabled it to judge more for a short time, the image rough recognition approach, the medium which recorded the image rough recognition program, image recognition equipment, and a color reproducing unit.

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention concerning claim 1 The storage means which put the distribution situation in a predetermined small field mainly concerning a chromaticity in a database based on the image data of the specimen, An image data input means to acquire color picture data, and a retrieval information acquisition means to acquire the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, It has considered as the configuration possessing a judgment means to judge whether there is any thing applicable to the distribution situation which searched the database of the above-mentioned storage means based on this acquired distribution situation, and was acquired from the above-mentioned specimen.
[0007] In invention concerning claim 1 constituted as mentioned above, if the distribution situation in a predetermined small field mainly concerning a chromaticity is put in a database based on the image data of the specimen with the storage means and color picture data are acquired with an image data input means, a retrieval information acquisition means will acquire the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field. Then, it judges whether a judgment means has a thing applicable to the distribution situation which searched the database of the above-mentioned storage means based on this acquired distribution situation, and was acquired from the above-mentioned specimen. Consequently, it can be said that possibility that the image of the specimen is contained in the color picture data read when there were some corresponding is high. What the storage means puts in a database is in the distribution situation in a small field mainly concerning a chromaticity, and can be said to be what expresses the color tone of the whole small field widely. That is, since there are many color tones of **** for every specimen, when the description can be found out to the color tone, it can be said that coincidence of a color tone is very effective. Of course, a color tone is not the semantics which eliminates the distribution situation of brightness etc. in a wide sense for the purpose of representing a pattern.

[0008] Although the distribution situation of a chromaticity can be searched for by various kinds of operations, considering distribution of a pattern, equalizing uniformly has a limitation in recognition effectiveness. For this reason, as an example showing distribution of a pattern, in image rough recognition equipment according to claim 1, the above-mentioned distribution situation classifies a rectangle field into two or more trains in a lengthwise direction and a longitudinal direction, invention concerning claim 2 calculates central value about each train, and it constitutes from a value which computed characteristic quantity about this central value. In invention concerning claim 2 constituted as mentioned above, first, the above-mentioned distribution situation classifies a rectangle field into two or more trains in a lengthwise direction and a longitudinal direction, and calculates central value about each train. Since the central value for two or more trains still exists in this condition next, characteristic quantity is computed based on this central value. Characteristic quantity here must not necessarily be one. However, what is necessary is making it just make it fluctuate according to need, in order for the possibility of incorrect recognition to also increase, while the rating of decision of little direction

becomes less.
[0009] As an example which expresses a distribution situation with small characteristic quantity, invention concerning claim 3 consists of a variance based on the central value about each of this train, or its default reading for the above-mentioned distribution situation in image rough recognition equipment according to claim 2. In invention concerning claim 3 constituted as mentioned above, in order to use the variance showing the variation condition about central value of representing each train, when a distribution situation is expressed, it is convenient. Of course, variances may be default readings, such as standard deviation, in the same semantics.
[0010] Though the distribution situation of a chromaticity is mainly searched for, if a bill is made into an example, image data etc. may change with dirt, wrinklings, etc. easily. If premised only on the new note, it does not become useful at all. As an example of a cure to change of such image data, invention concerning claim 4 is considered as the configuration which uses the default reading of the brightness which normalized the above-mentioned distribution situation, or brightness in image rough recognition equipment according to claim 1 to 3.
[0011] In invention concerning claim 4 constituted as mentioned above, after normalizing the default reading of the brightness in image data, or brightness, it is used for a distribution situation. For example, when image data is expressed with the gradation value of the concentration of an element color, even if dirt is conspicuous on the whole and brightness will become low, it becomes easy to eliminate the effect of the existence of dirt by normalizing this. Brightness here can also be considered to be the brightness as one pixel which constitutes image data, and can also consider the gradation value for every element color which constitutes one pixel to be brightness.
[0012] The distribution situation itself can specifically adopt various kinds of things that what is necessary is just mainly a thing about a chromaticity. As the example, the above-mentioned distribution situation consists of distribution situations about the color difference for invention concerning claim 5 in image rough recognition equipment according to claim 1 to 4. In invention concerning claim 5 constituted as mentioned above, it is because the distribution situation about the color difference is used, and this color difference has the property which is easy to use when seeing a color tone while it is not the component of only brightness.
[0013] Moreover, in image rough recognition equipment according to claim 1 to 5, the above-mentioned distribution situation consists of distribution situations about brightness for invention concerning claim 6 as other examples. The distribution situation about brightness is used in invention concerning claim 6 constituted as mentioned above. It is because distribution of a color bright as a distribution situation of a chromaticity and distribution of a dark color also have a useful property in the semantics of epicritic. Characteristic quantity does not necessarily need to be one kind of thing. In image rough recognition equipment according to claim 1 to 6, the above-mentioned characteristic quantity is obtained from two or more distribution situations, and invention concerning claim 7 consists of this semantics.
[0014] He is trying to obtain characteristic quantity from two or more distribution situations in invention concerning claim 7 constituted as mentioned above as it is in the distribution situation of the color difference, it is in the distribution situation of brightness or it is in other distribution situations. Abstracting like a distribution situation further also produces the facilities which do not remain only in rough recognition, not coming out of the specimen as a whole, and recognizing paying attention to a small field. As the example, invention concerning claim 8 is considered as the configuration which memorizes each above-mentioned distribution situation when the above-mentioned storage means rotates the above-mentioned specimen at an angle of the plurality which set spacing in image rough recognition equipment according to claim 1 to 7.
[0015] In invention concerning claim 8 constituted as mentioned above, the above-mentioned specimen was rotated at an angle of the plurality which set spacing, each above-mentioned distribution situation is memorized, and though it goes into the image data by which the bill etc. has been arranged aslant, what corresponds by searching a storage means with the distribution situation of the small field of a slanting condition can be found. This is based on the ability to be easy to find a match, though angle of rotation is shifted to some extent by being able to avoid that a storage region becomes huge and abstracting it like a distribution situation, even if it

makes it rotate although it is a small field therefore.
[0016] Although 360 hands of cut will exist strictly, a distribution situation must not necessarily be prepared in an omnidirection. The above-mentioned retrieval information acquisition means is considered as the configuration which extracts the distribution situation for the four quadrant which reflected object nature for every quadrant, invention concerning claim 9 memorizing the distribution situation in two or more angle of rotation which can set the above-mentioned storage means to one quadrant in image rough recognition equipment according to claim 8 as the example.
[0017] In invention concerning claim 9 constituted as mentioned above, an omnidirection is divided into a four quadrant, a distribution situation is memorized with angle of rotation only about the one quadrant, and the amount of data is simply set to one fourth. Moreover, since the distribution situation for a four quadrant that the retrieval information acquisition means reflected object nature for every quadrant is extracted even if done in this way, it will judge completely like the case where it rotates about an omnidirection. In judging whether the distribution situation acquired from image data and the distribution situation acquired from the specimen correspond, various kinds of comparison approaches are employable. As that example, as for the above-mentioned storage means, invention concerning claim 10 is equipped with the upper limit about the above-mentioned distribution situation, and a lower limit in image rough recognition equipment according to claim 1 to 9, and the above-mentioned judgment means judges whether the distribution situation by which acquisition was carried out [above-mentioned] enters between this upper limit and lower limit, and is constituted.
[0018] In invention concerning claim 10 constituted as mentioned above, the above-mentioned judgment means judges whether it enters between the upper limit of the distribution situation that the distribution situation by which acquisition was carried out [above-mentioned] is memorized with the above-mentioned storage means, and a lower limit. that is, by judging only size relation, data processing is boiled markedly and decreases. What is necessary is the situation each evaluation being adjusted arising, when using two or more distribution situations especially, but just coming to judge whether each going into the range, in using a upper limit and a lower limit.
[0019] Thus, the technique of judging whether based on the distribution situation in a small field mainly concerning a chromaticity, the image of the specimen is in image data does not necessarily need to be restricted to equipment with a stereo, and functioning also as the approach can be understood easily. For this reason, invention concerning claim 11 is the image rough recognition approach of judging whether the image of the specimen being contained in the color picture. While creating the database of the distribution situation mainly concerning a chromaticity in a predetermined small field based on the image data of the above-mentioned specimen The image data input process which acquires color picture data, and the retrieval information acquisition process which acquires the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, It has considered as the configuration possessing the judgment process which judges whether there is any thing applicable to the distribution situation which searched the above-mentioned database based on this acquired distribution situation, and was acquired from the above-mentioned specimen.
[0020] That is, there is no difference not only in the equipment which not necessarily has a stereo but in being effective as the approach. By the way, such image rough recognition equipment contains not only this but various kinds of modes as thought of that it may be used in the condition of existing independently and having been included in a certain device, and invention. Therefore, it can change suitably that it is software or hardware etc. When becoming the software of image rough recognition equipment as an example of embodiment of the thought of invention, naturally it exists on the record medium which recorded this software, and it must be said that it is used.
[0021] As the example, invention concerning claim 12 It is the medium which recorded the image rough recognition program which judges whether the image of the specimen is contained in the color picture. While creating the database of the distribution situation mainly concerning a

chromaticity in a predetermined small field based on the image data of the above-mentioned specimen The image data input step which acquires color picture data, and the retrieval information acquisition step which acquires the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, It has considered as the configuration possessing the judgment step which judges whether there is any thing applicable to the distribution situation which searched the above-mentioned database based on this acquired distribution situation, and was acquired from the above-mentioned specimen.

[0022] of course, the record medium may be a magnetic-recording medium, may be a magneto-optic-recording medium, and can completely be considered the same way in any record media developed from now on. Moreover, about duplicate phases, such as a primary replica and a secondary replica, it is equivalent without room to completely ask. In addition, even when carrying out as the supply approach using a communication line, change and there is no this invention in an available thing. Furthermore, a part is software, when the part is realized by hardware, in the thought of invention, it does not differ at all, and you may consider as the thing of a gestalt which memorizes the part on the record medium and is read suitably if needed.

[0023] Such image rough recognition equipment does not judge the existence of images, such as a bill, certainly as itself, and if the image of the specimen is contained, utility value will produce it on the assumption that it takes over to a detailed inspection. In this case, it is also possible to also have image recognition equipment and a color reproducing unit separately from this image rough recognition equipment and to become in one with these and to aim at improvement in effectiveness, although it is possible. First storage means by which invention concerning claim 13 put the distribution situation in a predetermined small field mainly concerning a chromaticity in a database based on the image data of the specimen, The second storage means which put the pattern in this smallness field in a database, and an image data input means to acquire color picture data, The first retrieval information acquisition means which acquires the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, The first judgment means which judges [the second retrieval information acquisition means which acquires a pattern for every field of this, and] whether there is any thing applicable to the distribution situation which searched the database of the storage means of the above first based on this acquired distribution situation, and was acquired from the above-mentioned specimen, The database of the storage means of the above second is searched based on the pattern acquired with the retrieval information acquisition means of the above second when it was judged that there are some which correspond with this first judgment means. It has considered as the configuration possessing the second judgment means which judges whether there is any thing applicable to the pattern acquired from the above-mentioned specimen.

[0024] In invention concerning claim 13 constituted as mentioned above, while putting the distribution situation in a predetermined small field mainly concerning a chromaticity in a database based on the image data of the specimen with the first storage means, the pattern in this smallness field is put in a database with the second storage means. Here, if an image data input means acquires color-picture data, it will judge [whether there is any thing applicable to the distribution situation that the first retrieval information acquisition means acquired the above-mentioned distribution situation from this read color-picture data for every field corresponding to the above-mentioned smallness field, searched the database of the storage means of the above first with the first judgment means based on this acquired distribution situation, and was acquired from the above-mentioned specimen, and]. A pattern acquires corresponding to this field, when it is judged that there are some which correspond with the first judgment means, on the other hand, the database of the storage means of the above second searches with the second retrieval information acquisition means based on the pattern from which the second judgment means was acquired with the retrieval information acquisition means of the above second, and it judges [whether there is any thing applicable to the pattern acquired from the above-mentioned specimen, and].

[0025] That is, it also enables it to have judged coincidence of a pattern about the same small

field, and when coincidence of the distribution situation which can be called rough recognition is obtained, the judgment activity of coincidence of the pattern which requires time amount for an operation is made reduced by judging coincidence of a pattern, while judging the existence of the image of the specimen based on the distribution situation about a chromaticity for every small field. In this case, the judgment of a pattern is performed in a small field and judgment rating decreases also in this very thing.

[0026] Judging a pattern for every small field does not mean necessarily not judging the coincidence as the whole. That is, as long as coincidence in a small field is obtained, you may judge whether the image of the whole specimen is contained based on the information. In this case, the relative location of the image of a small field and the whole image should show the location of the whole image, and comparative rating is limited. Moreover, when coincidence of a pattern is judged and it is in agreement about two or more small [specimen / one] field, you may make it memorize the positional information. And finally both positional information is analyzed, and when in agreement with the relative-position relation of original small fields, it can be judged as that in which the image of the specimen is contained.

[0027] Furthermore, carrying out image recognition in this way can also be realized as a color reproducing unit, if an example is taken [that it is the purpose that the image of the specimen is made not to be copied, in many cases, and]. As such an example, invention concerning claim 14 The first storage means which put the distribution situation in a predetermined small field mainly concerning a chromaticity in a database based on the image data of the specimen, The second storage means which put the pattern in this smallness field in a database, and an image data input means to acquire the color picture data about a copied subject, The first retrieval information acquisition means which acquires the above-mentioned distribution situation from this read color picture data for every field corresponding to the above-mentioned smallness field, The first judgment means which judges [the second retrieval information acquisition means which acquires a pattern for every field of this, and] whether there is any thing applicable to the distribution situation which searched the database of the storage means of the above first based on this acquired distribution situation, and was acquired from the above-mentioned specimen, The second judgment means which judges whether there is any thing applicable to the pattern which searched the database of the storage means of the above second based on the pattern acquired with the retrieval information acquisition means of the above second when it was judged that there are some which correspond with this first judgment means, and was acquired from the above-mentioned specimen, When it is judged that there are some which correspond with the color printing means which color-prints based on the above-mentioned color picture data, and the judgment means of the above second, it has considered as the configuration possessing a printing prohibition means to forbid color printing by the above-mentioned color printing means.

[0028] In invention concerning claim 14 constituted as mentioned above, since it will be judged that there are some which correspond with the judgment means of the above second when coincidence of a pattern is obtained after passing through rough recognition similarly, a printing prohibition means forbids color printing by the color printing means. Of course, in being usual [as which coincidence of a pattern is not regarded], a color printing means color-prints based on the above-mentioned color picture data.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the appearance perspective view of the color reproducing unit which applied the image rough recognition equipment concerning 1 operation gestalt of this invention.
[Drawing 2] It is drawing showing the outline configuration of the color scanner part in this color reproducing unit.
[Drawing 3] It is the block diagram of the copy server part in this color reproducing unit.
[Drawing 4] It is drawing showing the outline configuration of the color printer part in this color reproducing unit.
[Drawing 5] It is the appearance perspective view of a computer system which realizes the image rough recognition equipment of this invention.
[Drawing 6] It is the flow chart of the Maine processing in a color reproducing unit.
[Drawing 7] It is drawing showing signs that image data is low-resolution-ized.
[Drawing 8] It is the flow chart of a bill recognition routine.
[Drawing 9] It is the flow chart of a bill recognition routine.
[Drawing 10] It is drawing showing the small field part on a bill in bill recognition.
[Drawing 11] It is drawing showing the relative-position relation of a small field in bill recognition.

[Drawing 12] It is an explanatory view for computing the central value about a small field.
[Drawing 13] It is an explanatory view for computing the central value about a small field.
[Drawing 14] It is the explanatory view showing the relative rotation condition of the small field when rotating a bill.
[Drawing 15] It is the explanatory view showing the condition that pattern data change by 4 **** when rotating a bill.
[Drawing 16] It is drawing showing the situation of making a small field shifting and equalizing in the direction in every direction.
[Drawing 17] It is the flow chart of rough recognition characteristic quantity calculation processing.
[Drawing 18] It is the pareto of the brightness used for histogram IKORAIZESHON.
[Drawing 19] It is the conversion graph which carries out brightness conversion by histogram IKORAIZESHON.
[Drawing 20] It is drawing showing the translation table used for histogram IKORAIZESHON.
[Drawing 21] It is the model Fig. of L*u*v* color specification space.
[Drawing 22] It is the model Fig. of other color specification space.
[Drawing 23] It is drawing showing the database structure used by rough recognition.
[Drawing 24] It is drawing showing the database structure used by detail recognition.
[Drawing 25] It is drawing showing signs that the existence of a bill is judged from the relative-position relation of a block by detail recognition.
[Drawing 26] It is drawing showing the database structure which memorizes the relative-position relation of a block by detail recognition.
[Drawing 27] It is the block diagram which acquires the characteristic quantity of rough recognition by hardware.

[Drawing 28] It is the block diagram of a color reproducing unit showing the example of a configuration of only hardware.
[Description of Notations]
10 -- Color reproducing unit
20 -- Color scanner
21 -- Transparence plate
22 -- Lighting lamp
23 -- Line sensor
24 -- Line sensor
24a -- Driving belt
24b -- Pulley
24c -- Drive motor
25 -- Control circuit
30 -- Copy server
31 -- CPU
32 -- Bus
33 -- RAM
34 -- ROM
35 -- Control panel
35a -- Copy initiation carbon button
35b -- Ten key
35c -- Liquid crystal display
36 -- Hard disk
36 -- Hard disk
38 -- Image recognition substrate
40 -- Color printer
41 -- Print head
41a -- Print head unit
42 -- Print head controller
43 -- Print head shift motor
44 -- Paper feed motor
45 -- Printer controller
51 -- Color scanner
52 -- Color printer
53 -- Personal computer
61 -- Brightness data-conversion section
62 -- Histogram IKORAIZESHON section
63 -- Translation table
64 -- Brightness standard deviation calculation section
65 66 -- Color difference calculation section
67 -- Color difference standard deviation calculation section
68 -- Median calculation section
71 -- Control panel
72 -- Line sensor mechanical component
73 -- Line sensor
74 -- Data correction section
75 -- Image buffer
76 -- Rough image data acquisition section
77 -- Rough image database
78 -- Rough image data matching section
79 -- Detail image data acquisition section
81 -- Detail image database
82 -- Detail image data matching section
83 -- Copy prohibition judging section

84 -- Copy control section
85 -- Color printing section

[Translation done.]

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CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
[Section partition] The 3rd partition of the 6th section
[Publication date] February 28, Heisei 14 (2002. 2.28)

[Publication No.] JP,11-316839,A
[Date of Publication] November 16, Heisei 11 (1999. 11.16)
[Annual volume number] Open patent official report 11-3169
[Application number] Japanese Patent Application No. 10-123797
[The 7th edition of International Patent Classification]

G06T 7/00
H04N 1/60
1/46

[FI]

G06F 15/70 310
15/62 410 Z
15/70 455 A
H04N 1/40 D
1/46 Z

[Procedure revision]
[Filing Date] August 9, Heisei 13 (2001. 8.9)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] 0022
[Method of Amendment] Modification
[Proposed Amendment]
[0022] of course, the record medium may be a magnetic-recording medium, may be a magneto-optic-recording medium, and can completely be considered the same way in any record media developed from now on. Moreover, about duplicate phases, such as a primary replica and a secondary replica, it is equivalent without room to completely ask. Furthermore, a part is software, when the part is realized by hardware, in the thought of invention, it does not differ at all, and you may consider as the thing of a gestalt which memorizes the part on the record medium and is read suitably if needed.

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